II JAI SRIGURUDEV II

Sri Adichunchanagiri Shikshana Trust

SJB INSTITUTE OF TECHNOLOGY

Emerging Exponential Technologies

20MBA301

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EMERGING EXPONENTIAL TECHNOLOGIES-20MBA301

History

- The technology appear with the creation of the fire by the humans.

- Technology What is it?
- Technology is the knowledge and process of using the laws of nature to solve problems by designing and making products or structures.
- What is it for?
- Technology is used to solve problems that help meet human needs and wants.
- https://www.google.com/search?q=emerging+technologies&rlz=1C1CHBD_enIN881IN881&oq=EMERGING+TECHNOLOGIES&aqs=chrome.0.0i433i512l2j0i512l2j46i512j0i512l5.7540j1j7&sourceid=chrome&ie=UTF-8

Technology History

- A Chronological record of significant events often including an explanation of their causes.
- Technology
- Human innovation in action that involves the generation of knowledge and processes to develop
  systems that solve problems and extend human capabilities.

The Stone Age (1,000,000 - 3000BC)

- Paleolithic, Mesolithic, Neolithic are the ages addressed during this timeframe.
- Stone was used as the principal material for tool
  making.
- Tools used for hunting, digging, and other task.

500,000 10,001BC

Food Shelter Clothing Defense Transportation Communication Health

Hoe Harpoon Nets for fishing Cave Painting Hides for frames Oil lamp Needles Animal skins Fire Spear Bow arrow Dugout Hieroglyphics

The Bronze Age (3000 - 1200 BC)

- Agriculture technology began with planting seed
  and harvesting crops.
- Beginning of farming and aquaculture.
- Civilization began forming in Syria, Egypt, and Central America.
- Tools and weapons manufactured by artisans.

10,000 1BC

- Food Shelter Clothing Defense Transportation Communication Health Archimedes water screw Waterwheel Quern to grind corn Trained animals to pull plow Pottery Spoon Fishhook Sickle Sun-dried mud hut Lock key Rope pulley Gear Brick Arch Nail Glass Bath Vertical loom Cosmetics Enormous Stone Buildings Bronze Iron Weapons Knives Swords Sling Sled Wheel Sail Boat Skis Harness (oxen) Ink paper Cuneiform writing Phoenician alphabet Astrolabe Papyrus Etruscan alphabet First Coinage Maps False Teeth

The Iron Age (1200 BC - 1300 AD)

- The Middle Ages (500 - 1500 AD)
- Furnaces developed reaching temperatures of 2800ºF.
- Smelting of iron for tools and weapons.

AD 1 - 1399

- Food Shelter Clothing Defense Transportation Communication Health
  Aqueduct Windmill Horse Collar Horseshoe Porcelain Drinking Vessel Stained Glass Roman Central Heating Clock Dome Chimney Spinning Wheel Trousers Felt Hat Button Lace Crossbow Bronze-cast cannon Gunpowder Gun Magnetic Compass Roman roads Viking longboats Horse stirrup saddle Rudder Skates Movable type Paper from bamboo Stencil Pen Printing Hospital Spectacles

Renaissance (1300 AD - 1600 AD)

- First Helicopter
- First Periscope
- Aqueducts
- Telescope
- The Renaissance is famous for being a cultural revolution

AD 1400 - 1699

- Food Shelter Clothing Defense Transportation Communication Health
  Ice cream Pressure cooker Bottle cork Wallpaper Watch Theodile Toilet Thermostat Barometer Surveying Instruments Knitting Machine Umbrella Artillery shell Naval mine Hand Grenades Rifle Submarine Diving bell Dredger Telescope Wheelchair Gutenberg Press Arithmetic signs (-) Newspaper Envelope Calculating Machine Toothbrush Artificial limbs Microscope Thermometer Inoculation

Industrial Revolution (1700 AD - 1900)

- Assembly Lines
- Railroads
- Factories
- Textile Mills
- First Impact of Environmental Effects from factories.
- New power sources
-

AD 1700 - 1849

- Food Shelter Clothing Defense Transportation Communication
- Health
  Canned Food Threshing Machine Carbonated water Steam Tractor Reaper Seed Drill Fertilizer Sandwich Electricity Gas street light Iron frame building Fire Extinguisher Cement Matches Central Heating Spinning Jenny Power Loom Cotton Gin Sewing Machine Waterproof coat Dry Cleaning Winchester rifle Pars for guns Machine Gun Shrapnel Pneumatic tire Bicycle Lifeboat Locomotive Hot-air balloon Sextant Roller Skates Metric system Photography Lithography Typewriter Morse Telegraph Braille Steel pen Eraser Postage Stamp Bifocals Anesthetic Sedative Porcelain false teeth Ambulance Vaccination Plastic surgery Stethoscope Blood transfusion

1850 - 1899

- Food Shelter Clothing Defense Transportation Communication Health
  Barbed wire Refrigeration Condensed milk Milking machine Margarine Cola Breakfast cereal High rise building Plastics Linoleum Electric lighting Jeans Man-made fibers Zippers Aniline dyes Dynamite Submarine Automatic machine gun Torpedo Hang glider Airship Glider Clipper ship Diesel engine Automobile Helicopter Modern bicycle Motorcycle Telephone Typewriter Cinematography Wireless telegraph Radio Postcard Fountain pen Hypodermic syringe Pasteurization Dental drill Antiseptics Incubator X-ray Aspirin

1900 - 1945

- Food Shelter Clothing Defense Transportation Communication
- Health

Tea bag Frozen food Insecticide Combine harvester Supermarket Pre-stressed concrete Air conditioning Fluorescent lighting Vacuum cleaner Electric washing machine Nylon Artificial silk Poison gas Tank Radar Gas mask Aerial bomb Aircraft Tracked vehicles Safety glasses Seaplane Traffic lights Helicopter Jet aircraft Subway Motion pictures Television Xerox Ballpoint pen Electro- cardiograph Hearing aid Blood transfusion Chemotherapy Insulin Iron lung Kidney machine

Information Age (Present)

- Internet
- Plastic
- Synthetic fibers
- Computer
- Transistor
- Automated Factories
- Robotics
- Mobile Phones

1946 - Present

- Food Shelter Clothing Defense Transportation Communication Health Synthetic fertilizers Microwave oven Nonstick pan Domestic deep freezer Foods for use in space New strains of rice wheat Ultrasonic to detect fish Solar Panel Geodesic dome Synthetic turf Fiberglass insulation Modular dwellings Space Station Synthetic fiber Automatic clothes dryer Permanent creases in clothes Metallic fabric Atomic bomb Aircraft ejection seat Portable atomic weapon Rocket Hydrogen bomb ICBM Aqualung Hovercraft Lunar Vehicle Nuclear Submarine Monorail Train Space Shuttle Ultra High speed train VTOL aircraft Space station Fuel injected engines Magnetic levitation trains Space orbiters Photo typesetting Radar Transistor Satellite Instant camera Long-playing record Laser beam Fiber optics Computer network Hologram cameras Silicon chips Videotape Microprocessor Pocket calculator Integrated circuits Digitized typesetting Desktop publishing Compact disk player Laptop computer Space telescope IPOD Artificial voice box Heart lung machine Artificial heart other organs Equipment for organ transplants High-speed dental drill

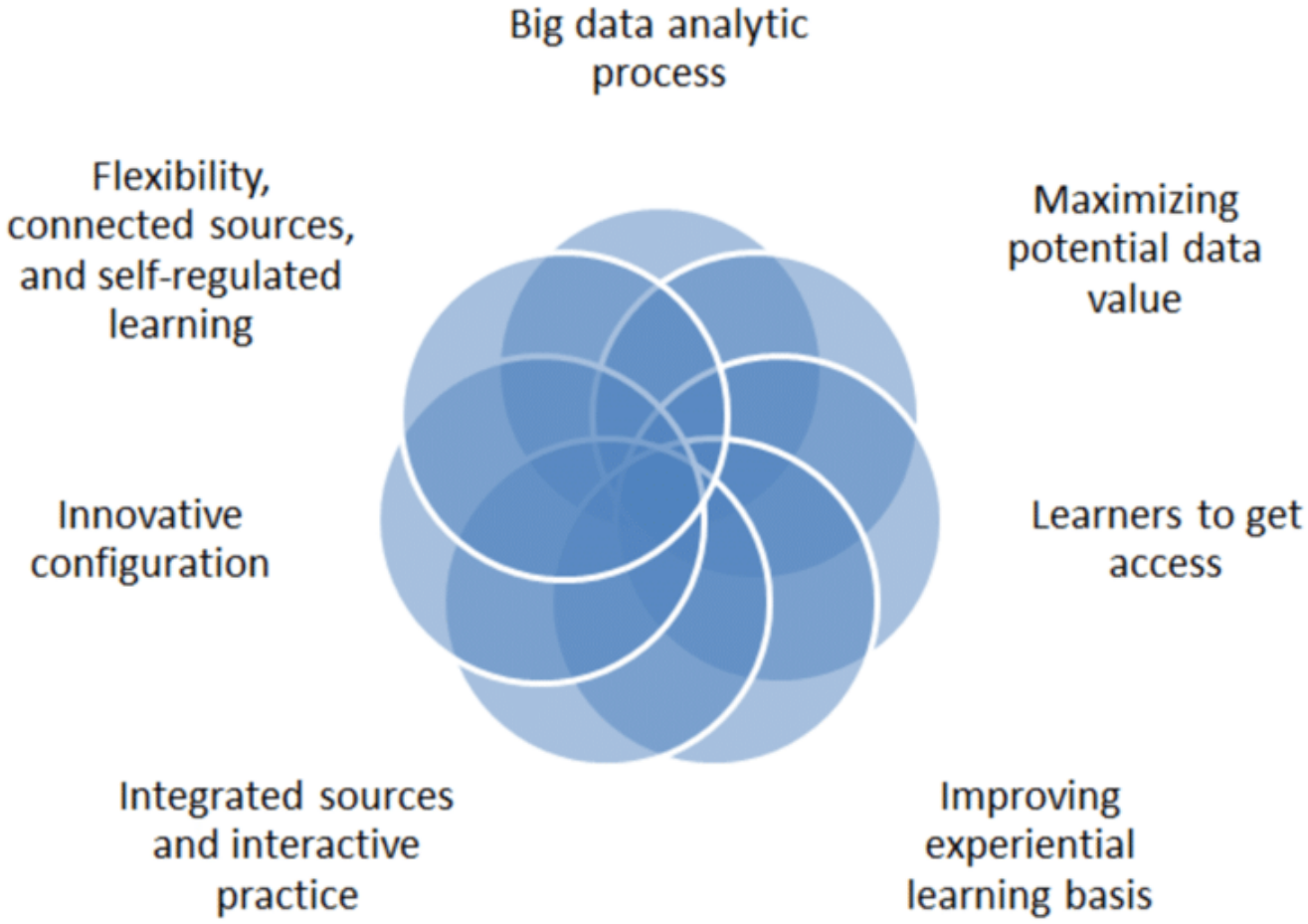
Conclusion

- Which period in history do you feel had the most impact on our human society?
- What period in history did more for the development of agriculture technology?
- Which period in history had the biggest impact on transportation technology?
- Which period in history had the biggest impact on communication technology?

ANSWERS

- Which period in history do you feel had the most impact on our human society?
- Industrial Revolution
- What period in history did more for the development of agriculture technology?
- Bronze Age (Mesopotamia)
- Which period in history had the biggest impact on transportation technology?
- Industrial Revolution
- Which period in history had the biggest impact on communication technology?
- Information Age

Role of data for Emerging technologies

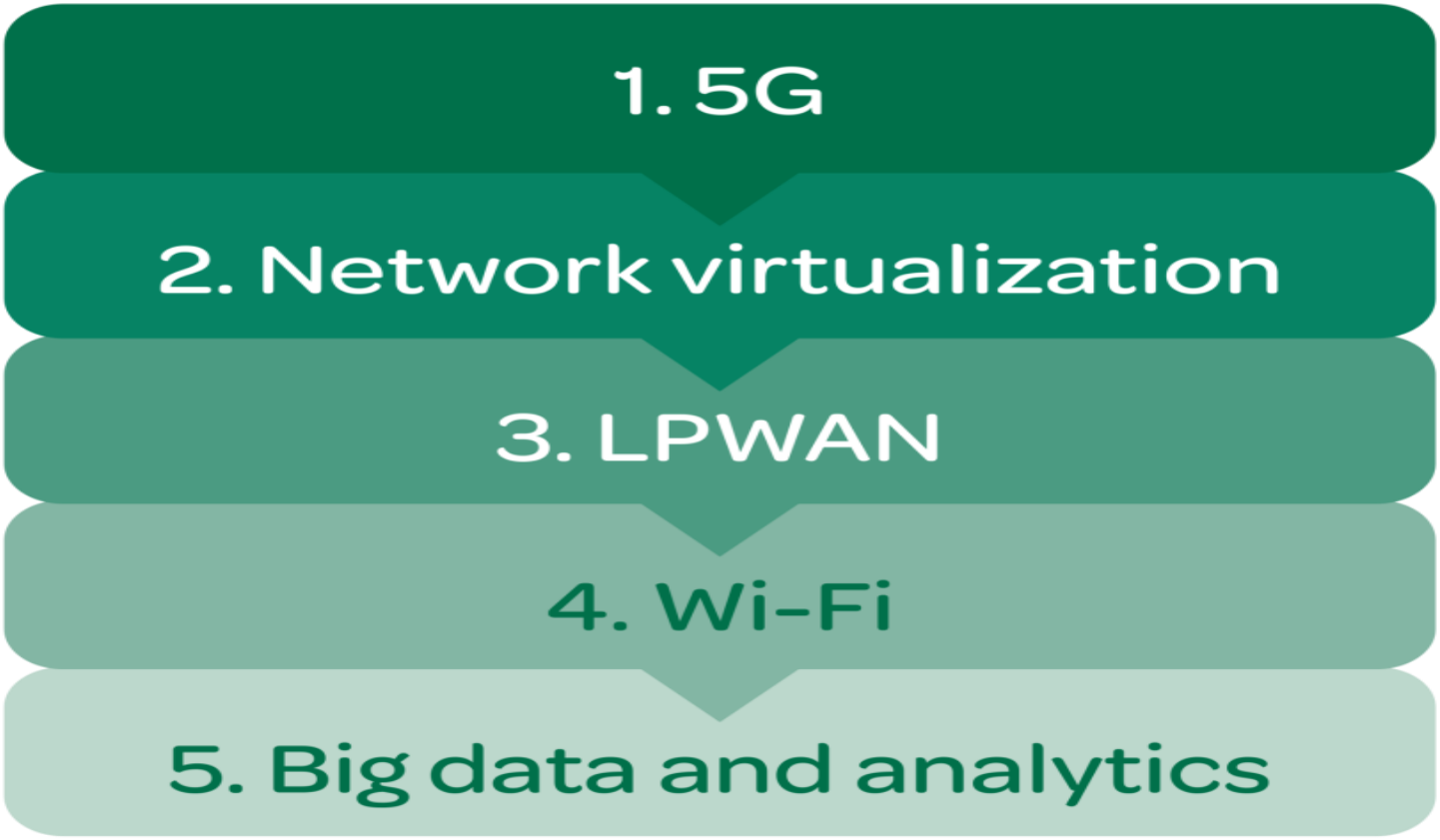


- Data science aims at **collecting, processing, analyzing, and presenting this data in a visual format to help companies or organizations in making crucial business decisions**. ... This boom is one of the major reasons why data scientists ar
- Data technologies are **developed to help manage data generated by human or by machines**, which will be 200 billion by 2020. Data technologies aim to manage growing data streams, get valuable insights from data and find solutions to integrate the most important data sources for companies and organizations.e in high demand.

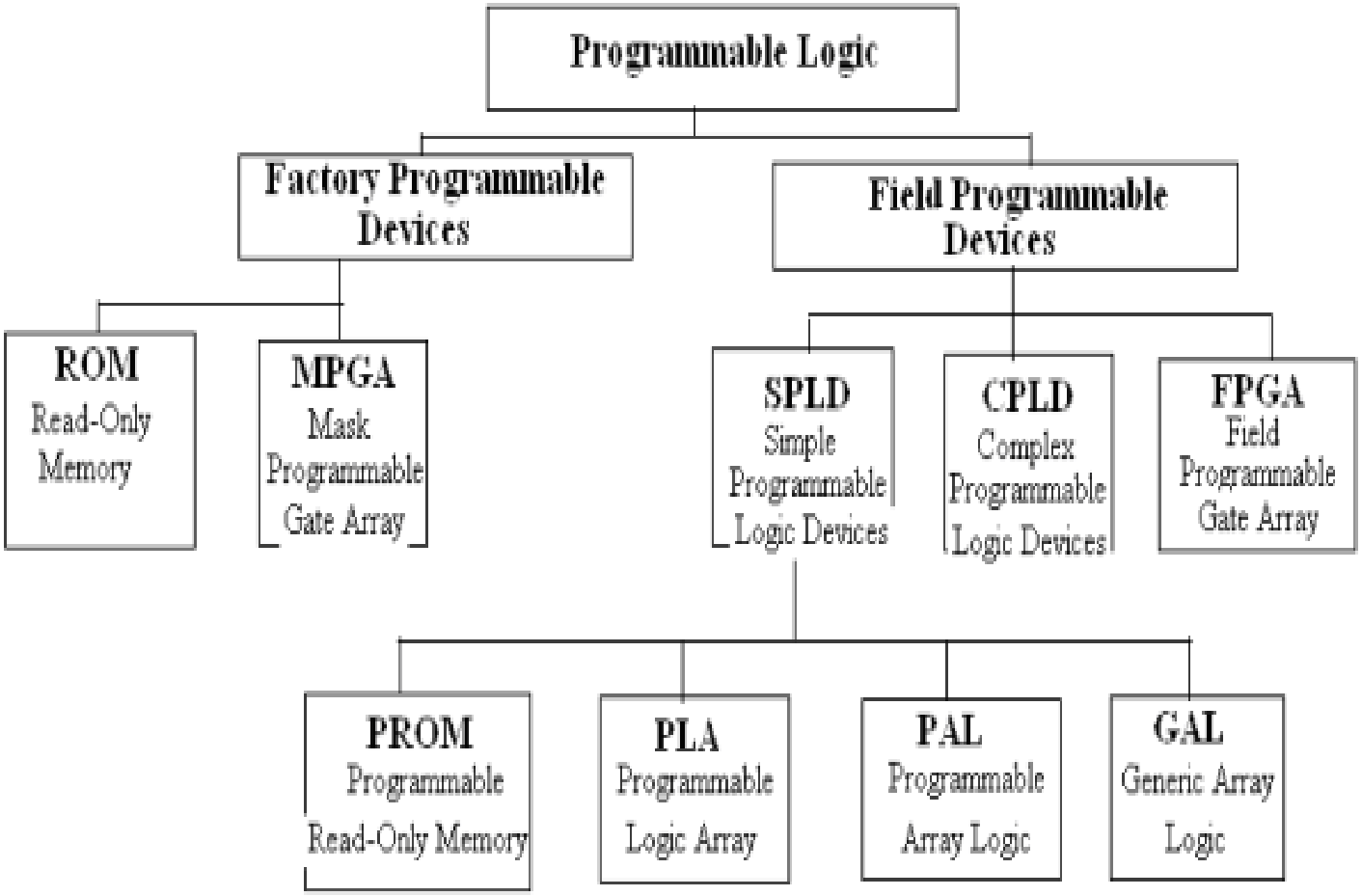
- Data **allows organizations to more effectively determine the cause of problems**. Data allows organizations to visualize relationships between what is happening in different locations, departments, and systems.
- **Improve People's Lives**
- **Make Informed Decisions**
- **Get The Results You Want**

- Find Solutions To Problems
- Stop The Guessing Game
- Access The Resources Around You

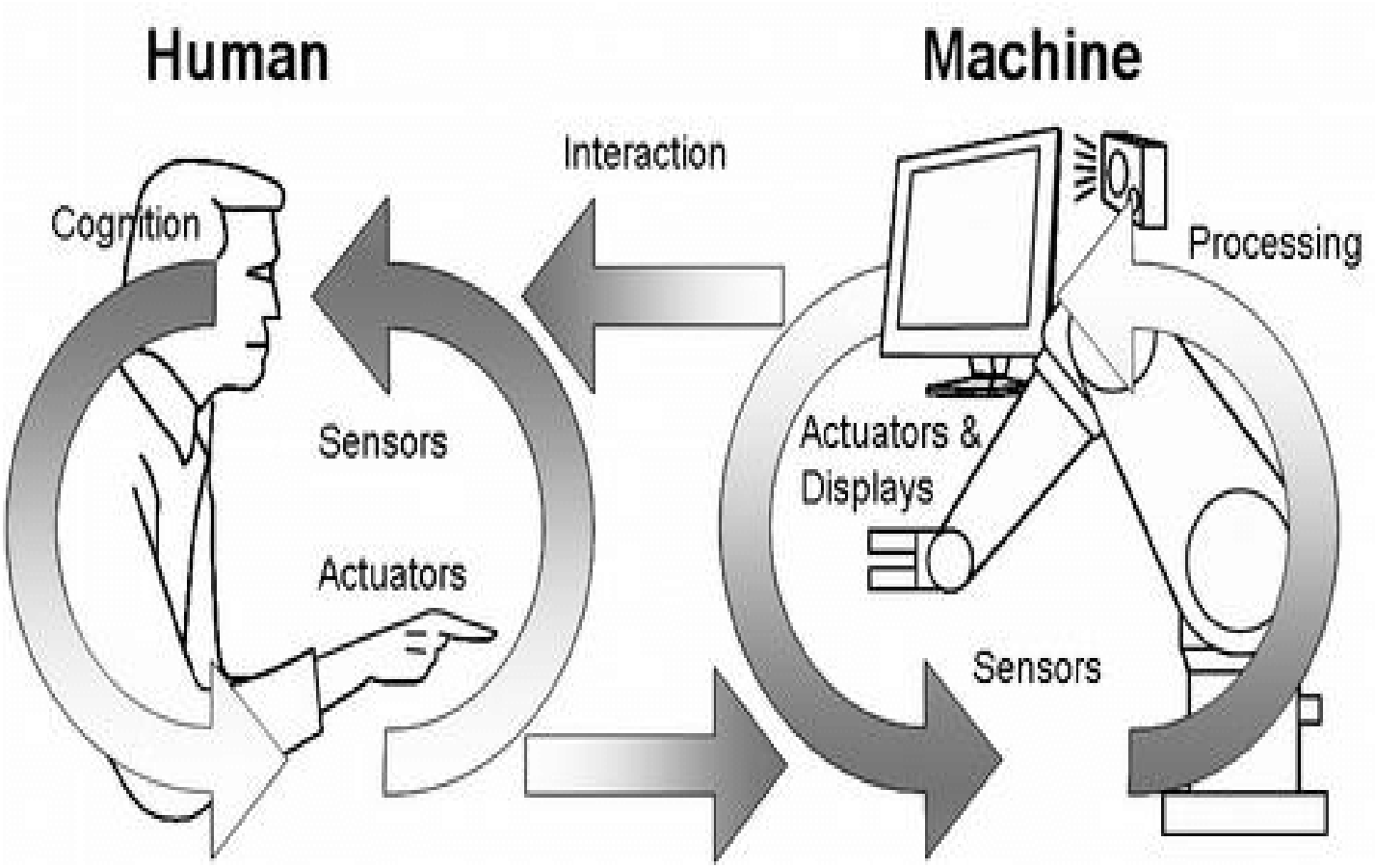
Enabling devices and networks for emerging technologies



Programmable devices



Human to Machine Interaction



- HMI is all about how people and automated systems interact and communicate with each other. That has long ceased to be confined to just traditional machines in industry and now also relates to computers, digital systems or devices for the Internet of Things (IoT). More and more devices are connected and automatically carry out tasks. Operating all of these machines, systems and devices needs to be intuitive and must not place excessive demands on users.

- Smooth communication between people and machines requires interfaces: The place where or action by which a user engages with the machine. Simple examples are light switches or the pedals and steering wheel in a car: An action is triggered when you flick a switch, turn the steering wheel or step on a pedal. However, a system can also be controlled by text being keyed in, a mouse, touch screens, voice or gestures.
- The devices are either controlled directly: Users touch the smartphone's screen or issue a verbal command. Or the systems automatically identify what people want: Traffic lights change color on their own when a vehicle drives over the inductive loop in the road's surface. Other technologies are not so much there to control devices, but rather to complement our sensory organs. One example of that is virtual reality glasses. There are also digital assistants: Chatbots, for instance, reply automatically to requests from customers and keep on learning.

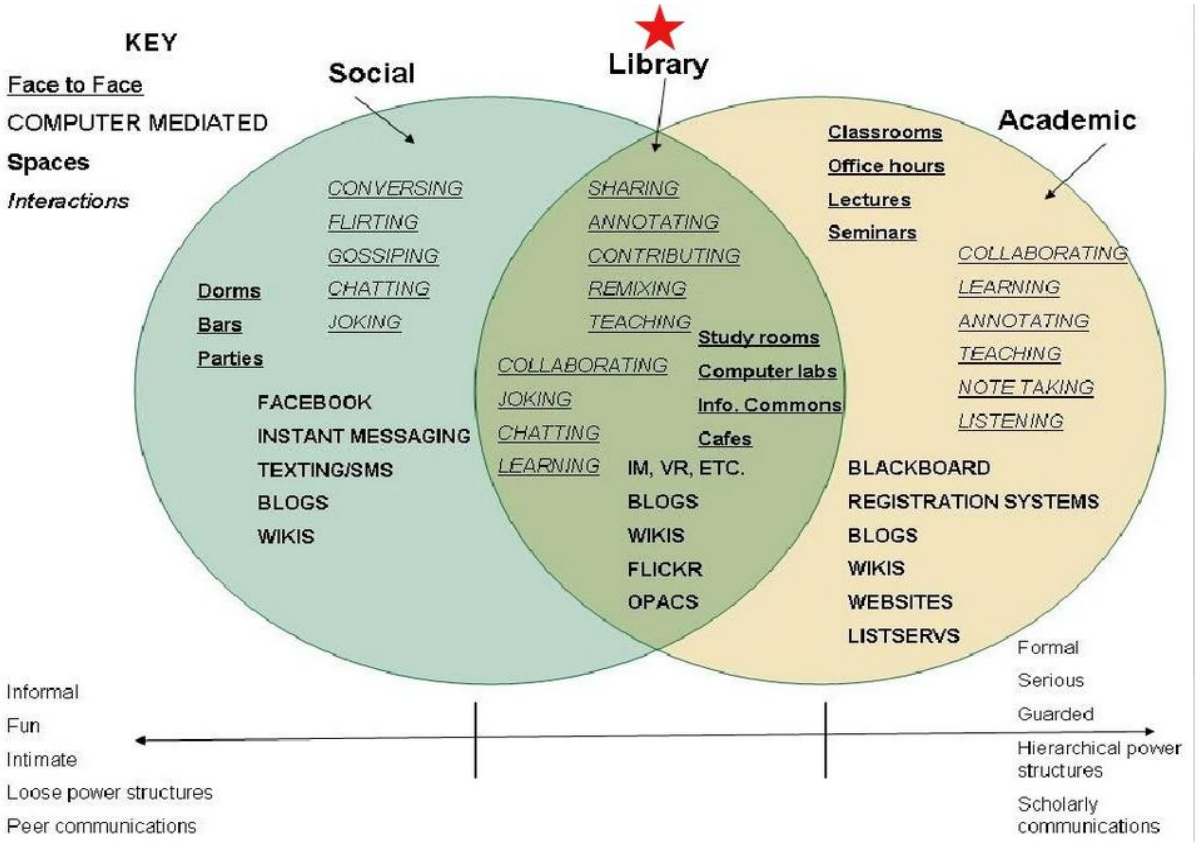
Future trends in emerging technologies.

- 5G Technology- A Boon For Businesses in 2021
- Autonomous Driving- An Easy, Safe Driverless Drive
- Edge computing- Bridging the Gap Between Data Storage and Computation
- Democratization- A Democracy in Technology
- Human Augmentation- Enhancing Cognitive Abilities
- Automation- For Advancements in Analytics

Meaning of Emerging Technologies

- Used to describe new Technology
- Or revamp existing technology
- Or it might be currently developing technology

Examples

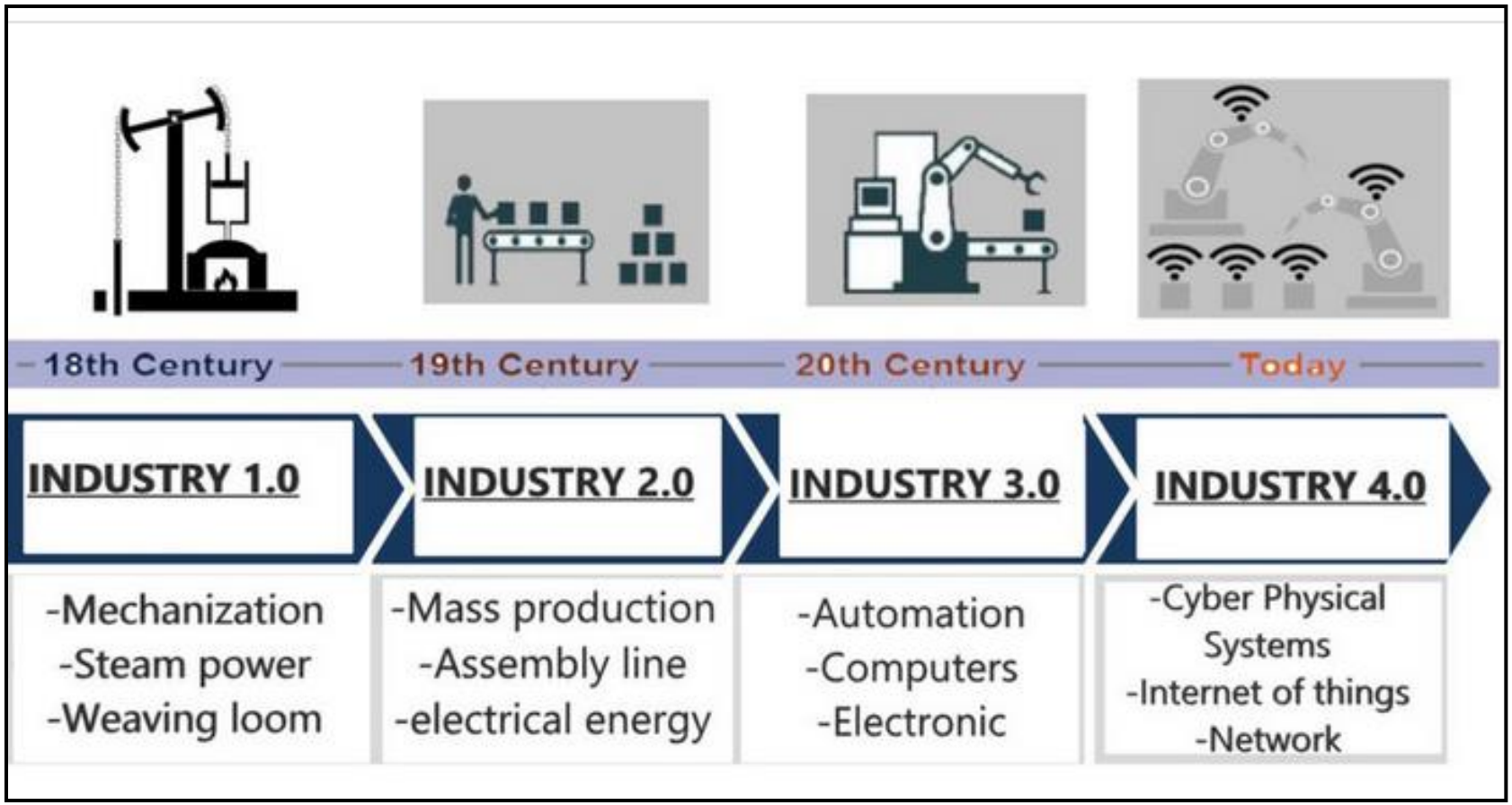

KEY
Face to Face
COMPUTER MEDIATED
Spaces
Interactions
Social
Library
Academic
CONVERSING
FLIRTING
GOSSIPING
CHATTING
JOKING
Dorms
Bars
Parties
FACEBOOK
INSTANT MESSAGING
TEXTING/SMS
BLOGS
WIKIS
SHARING
ANNOTATING
CONTRIBUTING
REMIXING
TEACHING
COLLABORATING
JOKING
CHATTING
LEARNING
Study rooms
Computer labs
Info. Commons
Cafes
IM, VR, ETC.
BLOGS
WIKIS
FLICKR
OPACS
Classrooms
Office hours
Lectures
Seminars
COLLABORATING
LEARNING
ANNOTATING
TEACHING
NOTE TAKING
LISTENING
BLACKBOARD
REGISTRATION SYSTEMS
BLOGS
WIKIS
WEBSITES
LISTSERVS
Informal
Fun
Intimate
Loose power structures
Peer communications
Formal
Serious
Guarded
Hierarchical power structures
Scholarly communications

Examples

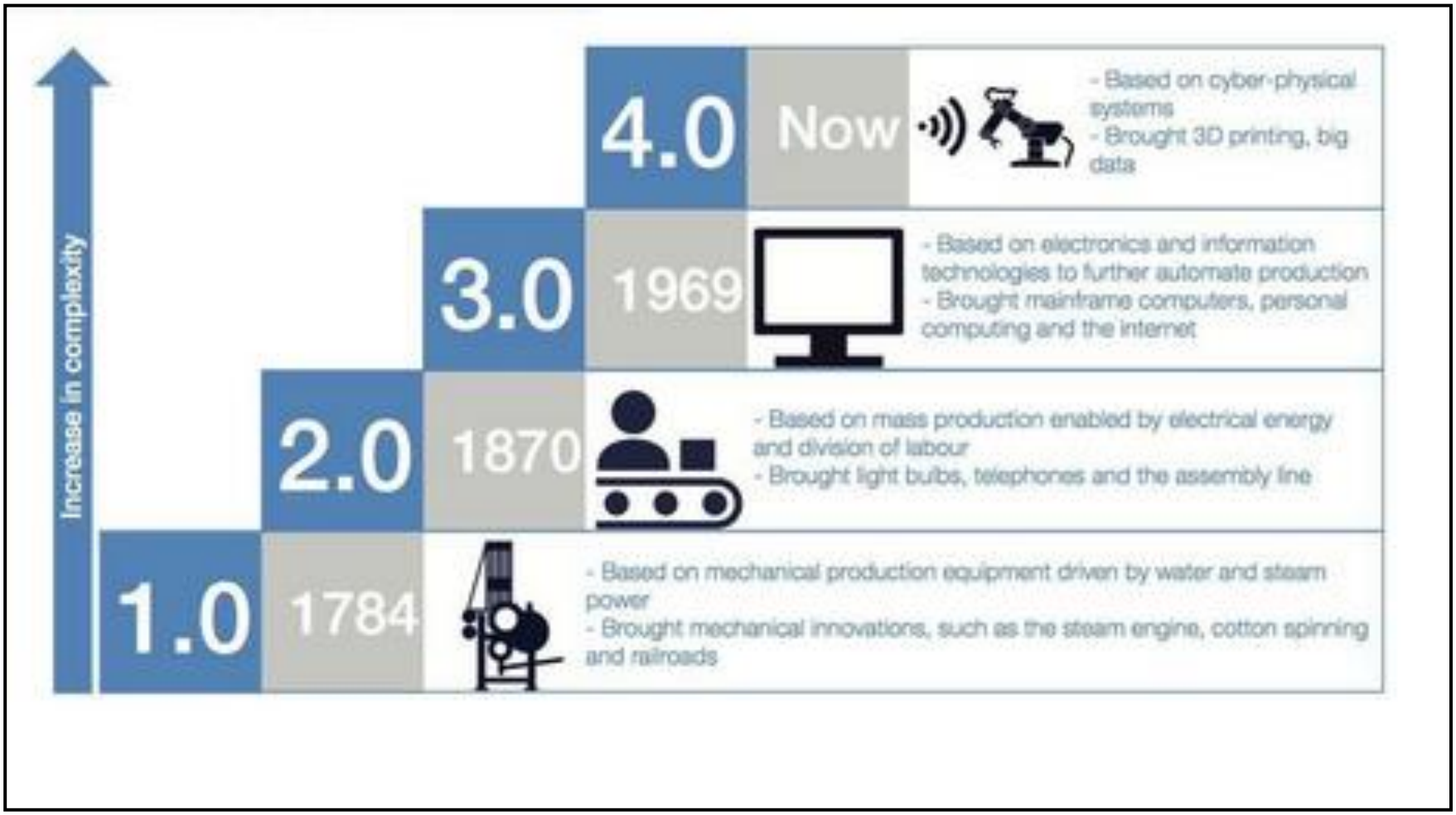
Current trends in libraries in library technology

- Blogging and other Web 2.0 technologies
- Broadband/High speed infrastructure / Wifi
- Digital Rights Management
- Ebooks and Eresources management
- ILS
- Metadata/MARC/Harvesting/Crosswalking
- Opensource
- Open access
- Portable devices
- Preservation of new media formats
- RSS
- Search engines/semantic web
- User generated content including folksonomies, i.e., tagging; user centered design

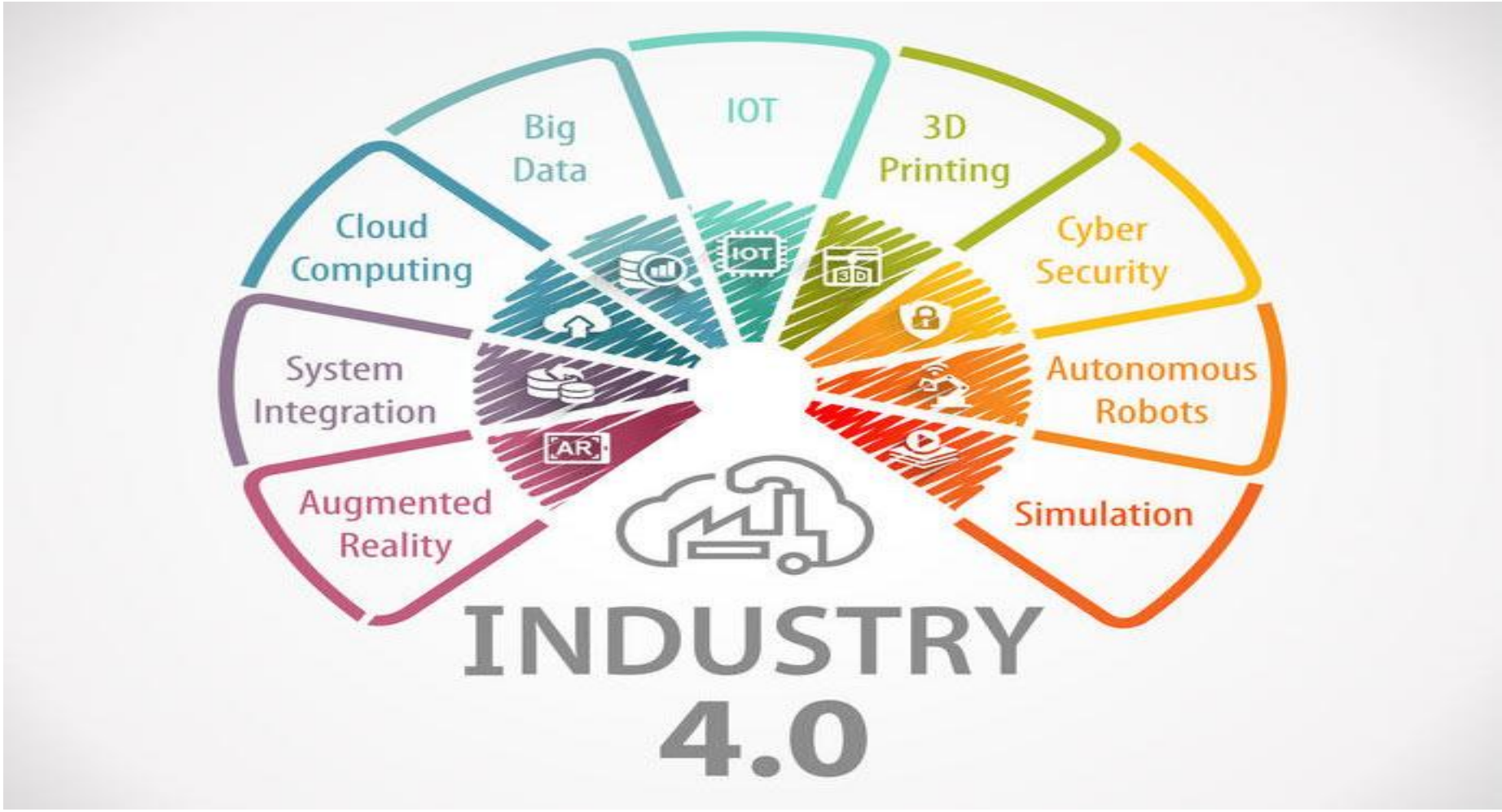
Industrial Background : History



EVOLUTION OF INDUSTRY



INDUSTRY 4.0


Big Data
IOT
3D Printing
Cloud Computing
Cyber Security
System Integration
Autonomous Robots
Augmented Reality
Simulation
INDUSTRY
4.0

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Designing for Emerging Technologies: UX for Genomics, Robotics, and the Internet of Things	Follett, J.	O'Reilly Media	2014
2	Emerging Technologies for Emerging Markets	Vong, J., & Song, I.	Springer Singapore	2014
3	Disruption: Emerging Technologies and the Future of Work	Del Rosal, V.	Emtechub.	2015
4	Emerging Internet-Based Technologies	Sadiku, M. N. O	CRC Press	2019
	Reference Books			
1	Digital Economy. Emerging Technologies and Business Innovation	Mohamed Anis Bach Tobji, Rim Jallouli, Yamen Koubaa, Anton Nijholt	-	2018
2	Virtual & Augmented Reality for Dummies	Paul Mealy,	-	2018
3	Augmented Reality and Virtual Reality: Empowering Human, Place and Business	Timothy Jung, M. Claudia tom Dieck	-	2019

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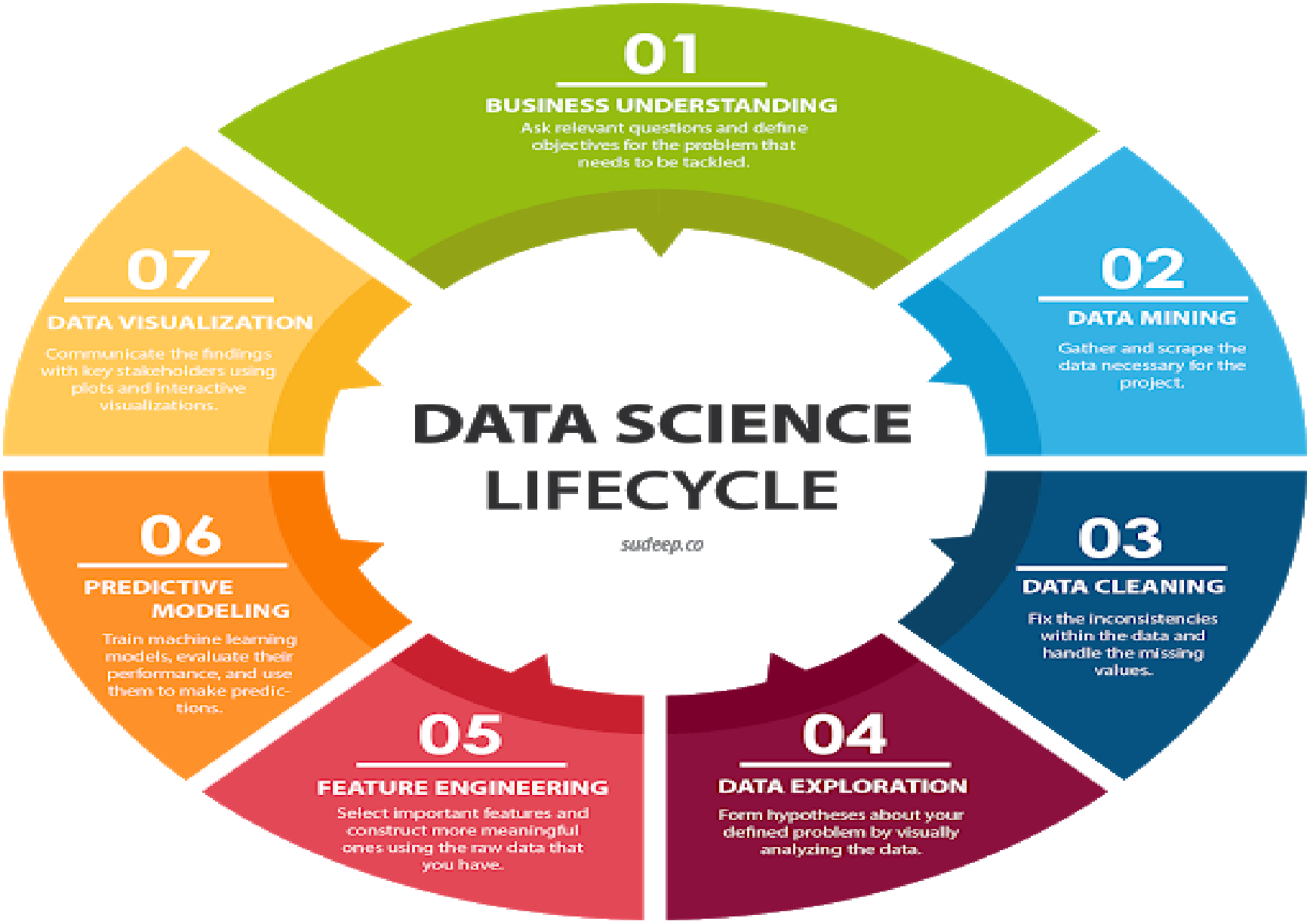
SYLLABUS: Overview for Data Science; Definition of data and information; Data types and representation; Data Value Chain; Data Acquisition; Data Analysis; Data Curating; Data Storage; Data Usage; Basic concepts of Big Data.


ANALYSIS
VISUALIZATION
SYSTEM
KNOWLEDGE
METHODS
STRUCTURE
INFORMATION
DATA
PROCESS
SCIENCE
TECHNOLOGY
KNOWLEDGE
SOLVING
PROGRAMMING


01
BUSINESS UNDERSTANDING
Ask relevant questions and define objectives for the problem that needs to be tackled.
02
DATA MINING
Gather and scrape the data necessary for the project.
03
DATA CLEANING
Fix the inconsistencies within the data and handle the missing values.
04
DATA EXPLORATION
Form hypotheses about your defined problem by visually analyzing the data.
05
FEATURE ENGINEERING
Select important features and construct more meaningful ones using the raw data that you have.
06
PREDICTIVE MODELING
Train machine learning models, evaluate their performance, and use them to make predictions.
07
DATA VISUALIZATION
Communicate the findings with key stakeholders using plots and interactive visualizations.
DATA SCIENCE LIFECYCLE
sudeep.co

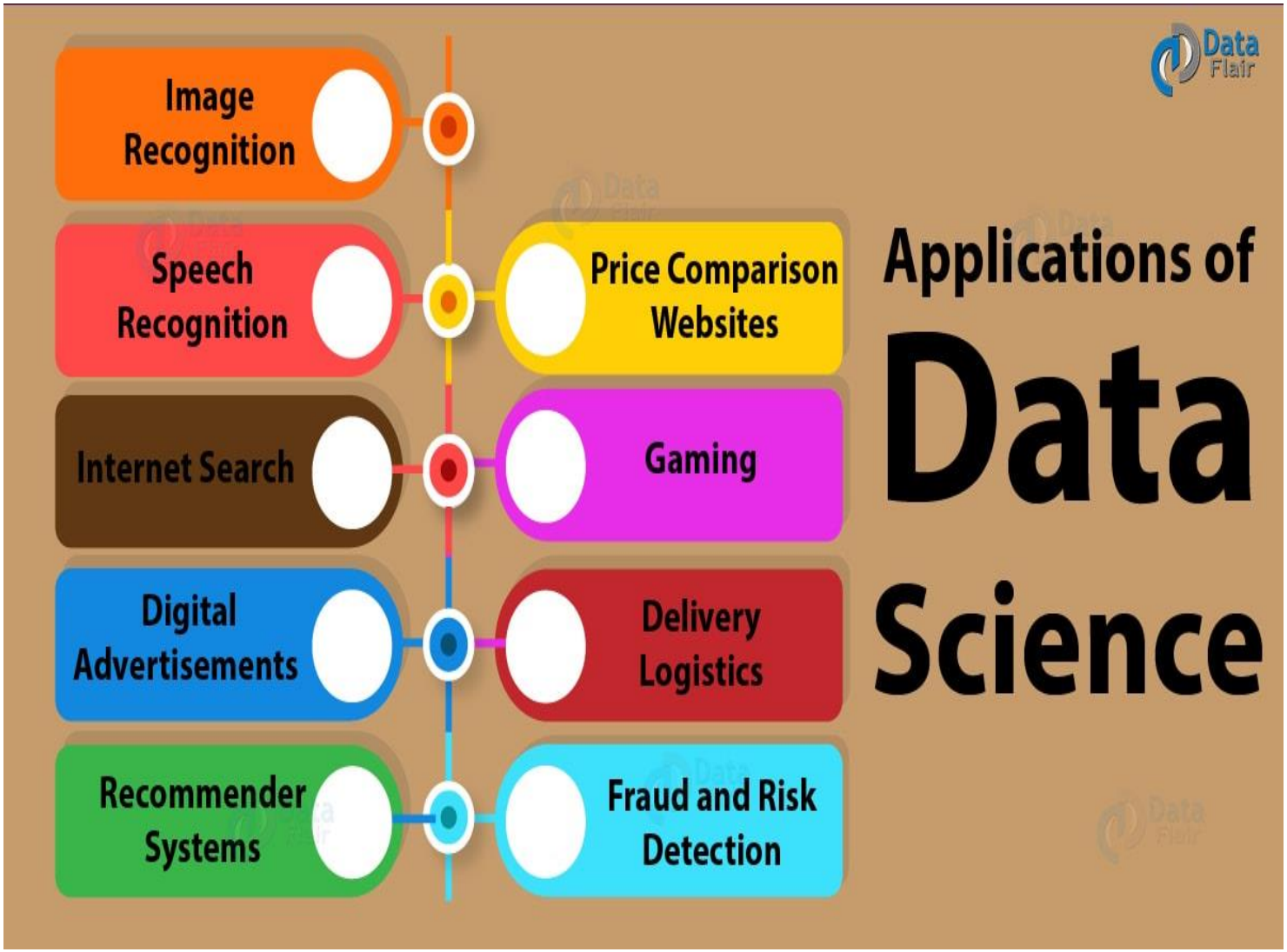


Image Recognition
Speech Recognition
Internet Search
Digital Advertisements
Recommender Systems
Price Comparison Websites
Gaming
Delivery Logistics
Fraud and Risk Detection
Applications of
Data
Science
Data Flair

- https://data-flair.training/blogs/data-science-tutorial/
- Data science is the practice of **mining** large data sets of raw data, both structured and unstructured, to identify patterns and extract actionable insight from them.
- Have you ever wondered how Amazon, eBay suggest items for you to buy?
- How Gmail filters your emails in the spam and non-spam categories?
- How Netflix predicts the shows of your liking?

Video

- https://youtu.be/csj6RE-EmSU
- https://towardsdatascience.com/intro-to-data-science-531079c38b22
- Data science is an interdisciplinary field that uses scientific methods, processes, algorithms and systems to extract knowledge and insights from noisy, structured and unstructured data, and apply knowledge and actionable insights from data across a broad range of application domains.

Definition of data and information

DIFFERENCE BETWEEN DATA AND INFORMATION

BYJU'S The Learning App

DATA

Data is raw, unorganized facts that need to be processed. Data can be something simple and seemingly random and useless until it is organized.

INFORMATION

When data is processed, organized, structured or presented in a given context so as to make it useful, it is called information.

Data	Information
Data is unorganised and unrefined facts	Information comprises processed, organised data presented in a meaningful context
Data is an individual unit that contains raw materials which do not carry any specific meaning.	Information is a group of data that collectively carries a logical meaning.
Data doesn't depend on information.	Information depends on data.
It is measured in bits and bytes.	Information is measured in meaningful units like time, quantity, etc.
Raw data alone is insufficient for decision making	Information is sufficient for decision making
An example of data is a student's test score	The average score of a class is the information derived from the given data.

Difference between data, information, and knowledge

DATA

- (1) A separate and disorganized pieces of information are called data is information.
- (2) Data is the primary form and foundation of information and knowledge.
- (3) Data is a phenomenal fact.
- (4) This difference can be understood by this example. Data - Cotton / Cotton
- (5) This is the primary level of Wisdom

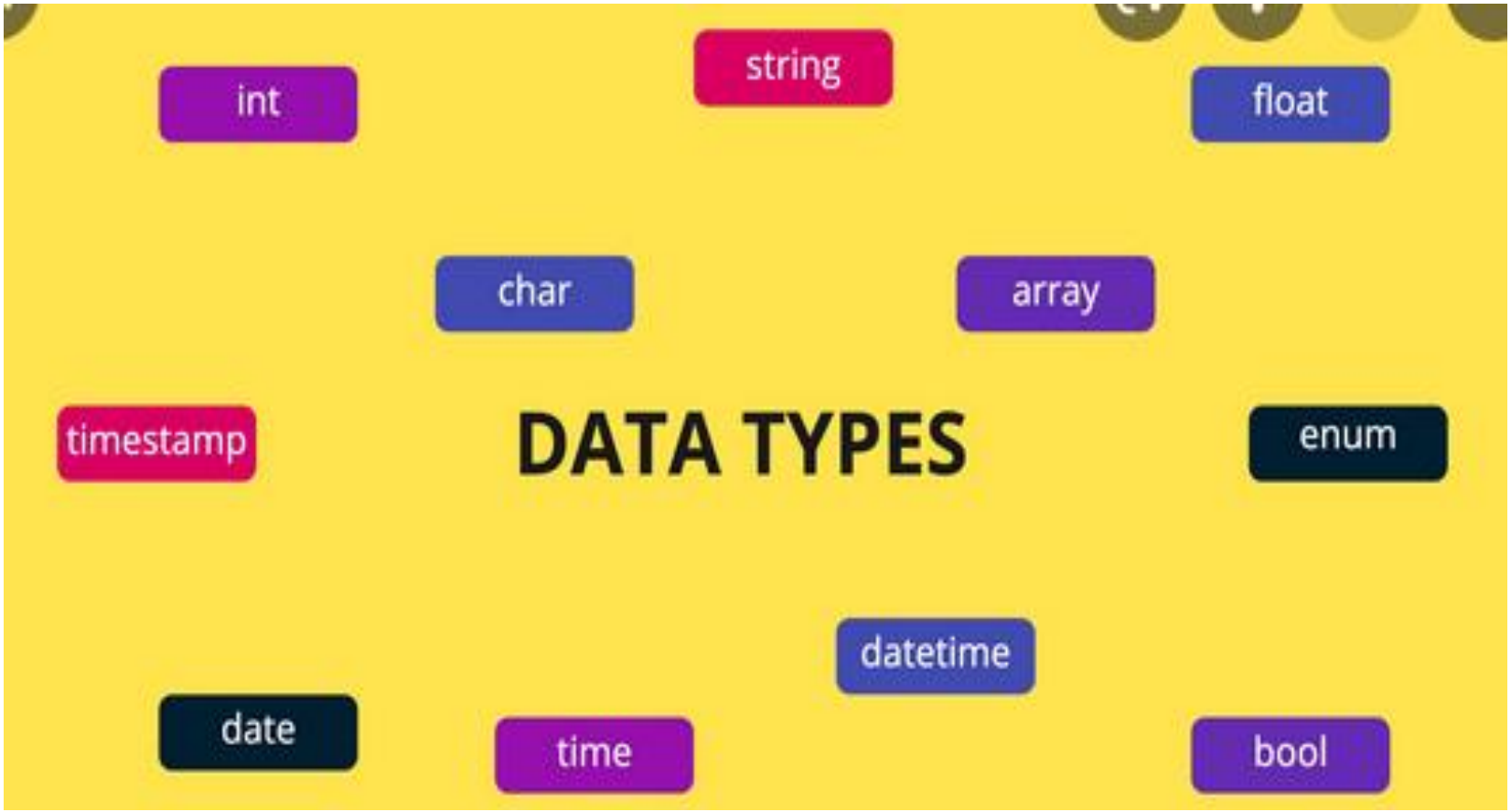
INFO

- (1) The streamlined pattern of data is called information.
- (2) Information is made up of data and is helpful in building knowledge.
- (3) Information is organized data.
- (4) Example: Intermediary
- (5) This is the secondary level of intelligence.

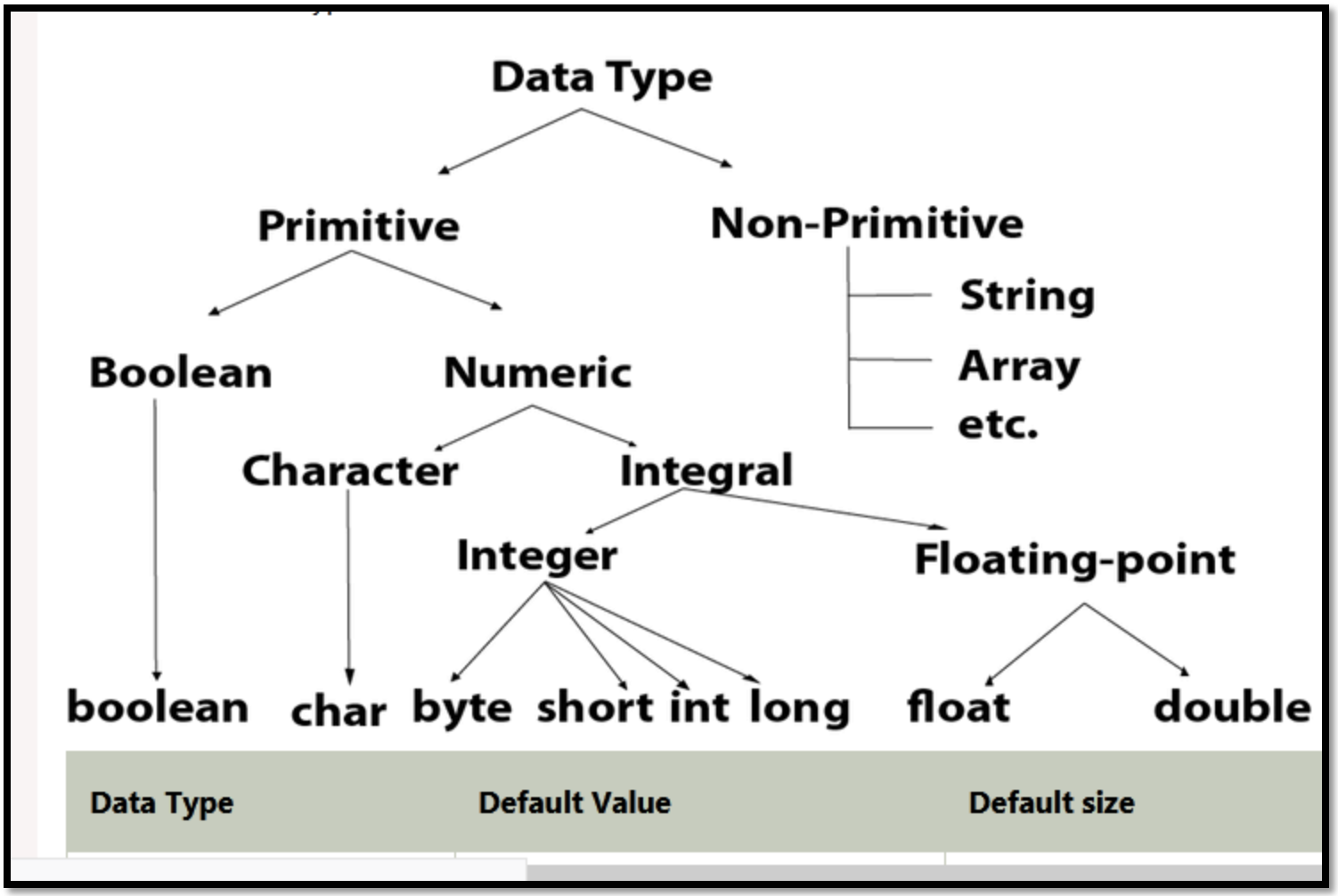
KNOWLEDGE

- (1) The knowledge of a well-organized body of information is called Knowledge.
- (2) Knowledge is complete.
- (3) Knowledge is equipped with information.
- (4) Finished product
- (5) This is the third level of intelligence.

TYPES OF DATA

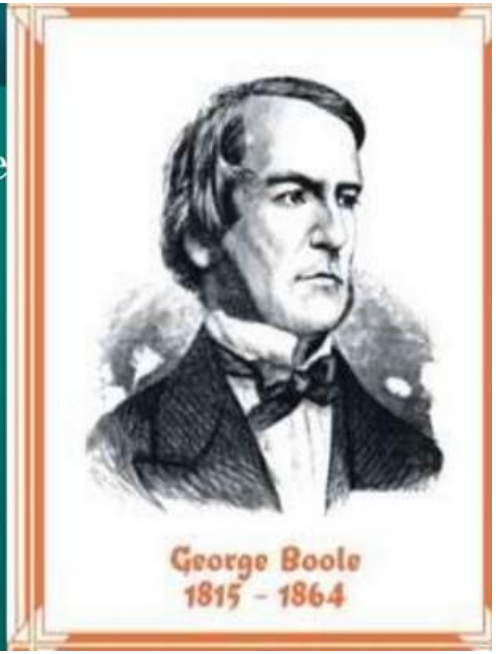


DATA TYPES continued……



Boolean

- Developed by the English mathematician and computer pioneer George Boole



Boolean expressions are expressions that result in the value of either **TRUE or FALSE**

- **Boolean** consists of operators such as :

AND
OR
NOT
XOR

2. Integer

- A numeric value
  - for example:

    1 and 1234 are examples of integers.

A **negative integer** is any negative numeric value,

- for example:

  -1 and -1234

  are examples of a negative integers. In most programming languages, you can convert a number into an integer using the **int** function. Below is an example of how this could be done in Perl.

3. Floating-point

- a **floating-point** is a variable type that is used to store floating-point number values. A floating-point number is one where the position of the decimal point can **"float"** rather than being in a fixed position within a number.

3. Floating-point

- For example

  a floating-point number could have the decimal be at any position, as in the numbers 1.23, 87.425, 9039454.2. Different programming languages or systems may have different size limits or ways of defining floating-point numbers.

4. Character

Sometimes abbreviated

char, a **character** is a single visual object used to represent text, numbers, or symbols

4. Character

Sometimes abbreviated

char, a **character** is a single visual object used to represent text, numbers, or symbols

. For example, the letter "A" is a single character. With a computer one character is equal to one byte. See the char definition for a full definition on the char programming term.

5. Alphanumeric

- Description of content that is both **letters and numbers.**

5. Alphanumeric

For example,

"1a2b3c"

is a short string of **alphanumeric characters.**

1. .NET

Microsoft .net

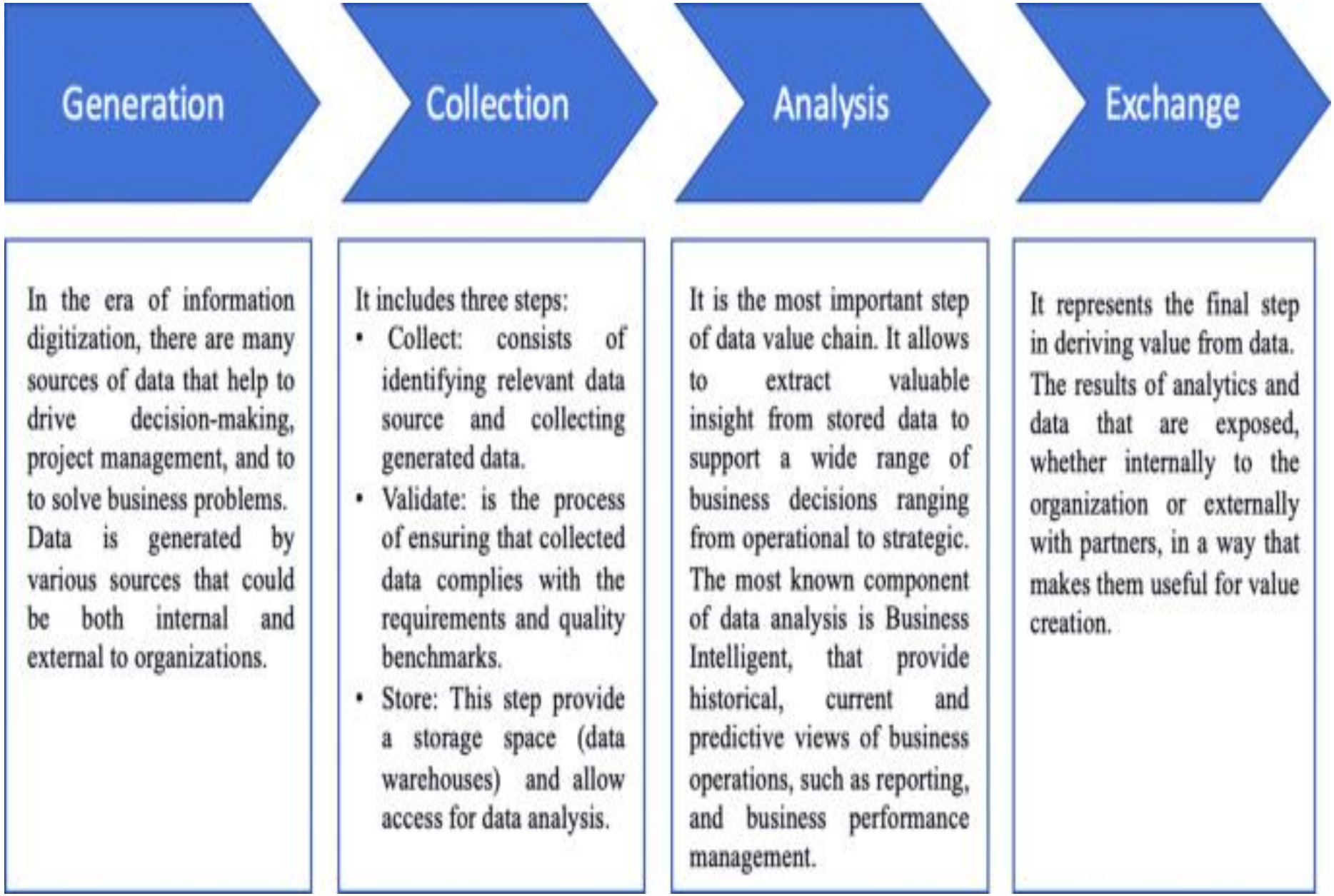
.NET is a Microsoft web services strategy to connect information, people, systems, anddevices through software, making it easier for users to share and use their information between multiple websites, programs, and computers.

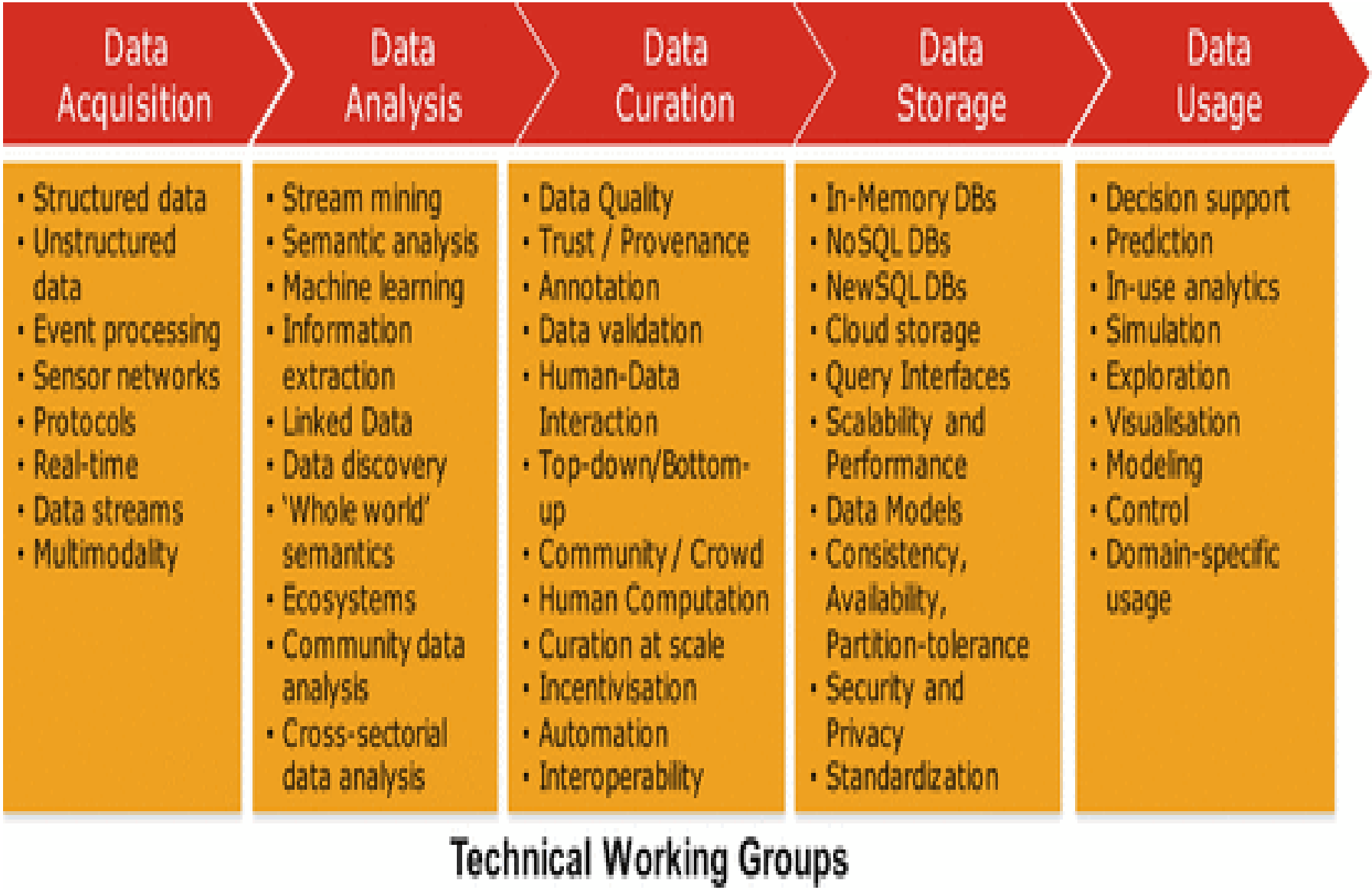
Data Representations

- Computer handles data in the form of ‘0’(Zero) and ‘1’ (One). Any kind of data like number, alphabet, special character should be converted to ‘0’ or ‘1’ which can be understood by the Computer. ‘0’ and ‘1’ that the Computer can understand is called **Machine language**. ‘0’ or ‘1’ are called ‘**Bi**nary Digi**t**s’(BIT). Therefore, the study of data representation in the computer is importa
-
-

A **nibble** is a collection of 4 bits (Binary digits).

A **bit** is the short form of **Binary digit** which can be ‘0’ or ‘1’. It is the basic unit of data in computers.


Generation
In the era of information digitization, there are many sources of data that help to drive decision-making, project management, and to to solve business problems. Data is generated by various sources that could be both internal and external to organizations.
Collection
It includes three steps:
• Collect: consists of identifying relevant data source and collecting generated data.
• Validate: is the process of ensuring that collected data complies with the requirements and quality benchmarks.
• Store: This step provide a storage space (data warehouses) and allow access for data analysis.
Analysis
It is the most important step of data value chain. It allows to extract valuable insight from stored data to support a wide range of business decisions ranging from operational to strategic. The most known component of data analysis is Business Intelligent, that provide historical, current and predictive views of business operations, such as reporting, and business performance management.
Exchange
It represents the final step in deriving value from data. The results of analytics and data that are exposed, whether internally to the organization or externally with partners, in a way that makes them useful for value creation.


Data Acquisition
Data Analysis
Data Curation
Data Storage
Data Usage
• Structured data
• Unstructured data
• Event processing
• Sensor networks
• Protocols
• Real-time
• Data streams
• Multimodality
• Stream mining
• Semantic analysis
• Machine learning
• Information extraction
• Linked Data
• Data discovery
• 'Whole world' semantics
• Ecosystems
• Community data analysis
• Cross-sectorial data analysis
• Data Quality
• Trust / Provenance
• Annotation
• Data validation
• Human-Data Interaction
• Top-down/Bottom-up
• Community / Crowd
• Human Computation
• Curation at scale
• Incentivisation
• Automation
• Interoperability
• In-Memory DBs
• NoSQL DBs
• NewSQL DBs
• Cloud storage
• Query Interfaces
• Scalability and Performance
• Data Models
• Consistency, Availability, Partition-tolerance
• Security and Privacy
• Standardization
• Decision support
• Prediction
• In-use analytics
• Simulation
• Exploration
• Visualisation
• Modeling
• Control
• Domain-specific usage
Technical Working Groups

- The data value chain describes the full data lifecycle from collection to analysis and usage. In other words, it categorizes all of the various steps required to transform raw data into useful insights. As explained on Open Data Watch, “The value chain describes connections between each step that change low-value inputs into high-value outputs. Although it has a logical flow, from start to finish, a value chain has no theory: it is a pragmatic construct.
- https://link.springer.com/chapter/10.1007/978-3-319-21569-3_3

Data Acquisition

- This refers to the collection of raw data from both internal and external sources. The first phase of data collection involves identifying what data to collect and then establishing a process to do so (i.e. conducting a survey or retrieving automated IoT data).
- Decisions made here will affect the quality and usability of data throughout its life-cycle.

Data Analysis

- Bad data in equals bad insights out so, once data is collected, it must be, processes organized and cleansed.
- This involves cleaning data - identifying and correcting corrupt, inaccurate, or irrelevant data - as well as converting raw data into a format that is usable, integratable and machine readable.

Data Curation

- Integration & Enrichment - Data curation and integration refers to the collection of processes required to merge data from multiple sources into one, cohesive dataset. During this process, data is also enriched, meaning that contextual metadata (the data that makes larger datasets discoverable) is added or updated.

Data Storage

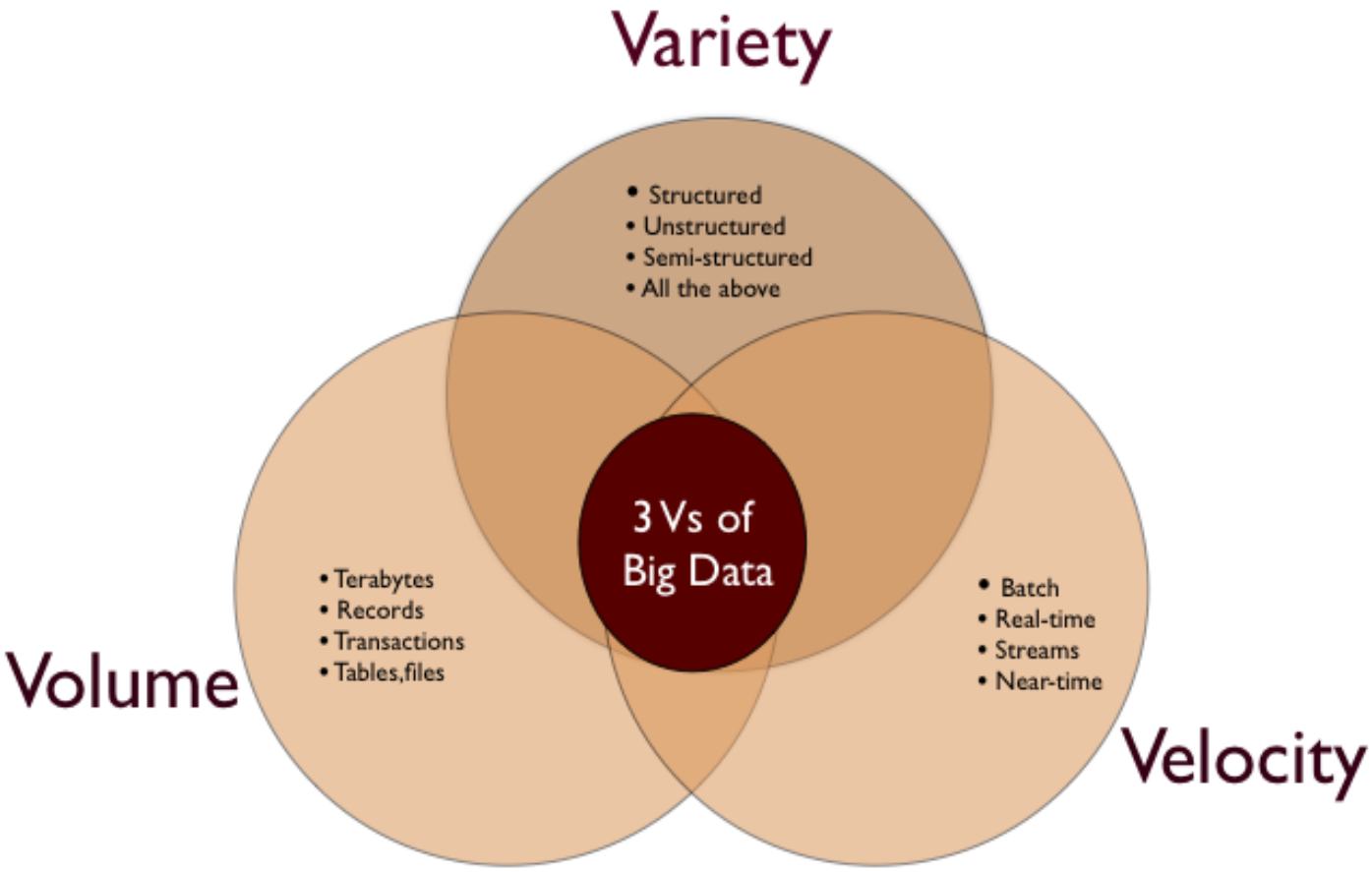
- Now that data has been cleansed, labeled and is primed for usage, the real fun can begin. Datasets can now be analyzed and used to uncover trends, patterns and other insights that can enhance decision making

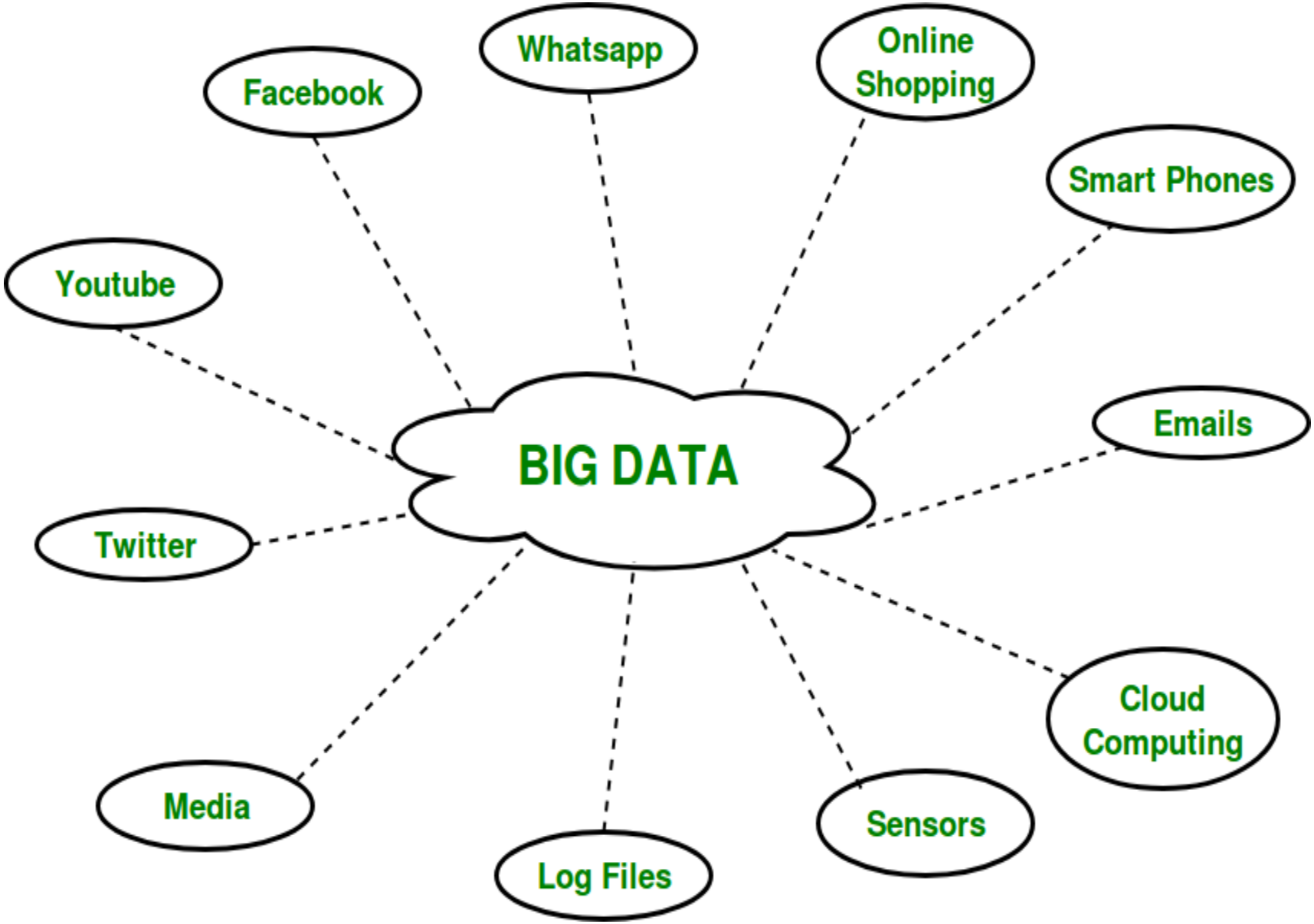
- is the persistence and management of data in a scalable way that satisfies the needs of applications that require fast access to the data. Relational Database Management Systems (RDBMS) have been the main, and almost unique, solution to the storage paradigm for nearly 40 years.
- However, the ACID (Atomicity, Consistency, Isolation, and Durability) properties that guarantee database transactions lack flexibility with regard to schema changes and the performance and fault tolerance when data volumes and complexity grow, making them unsuitable for big data scenarios. NoSQL technologies have been designed with the scalability goal in mind and present a wide range of solutions based on alternative data models.

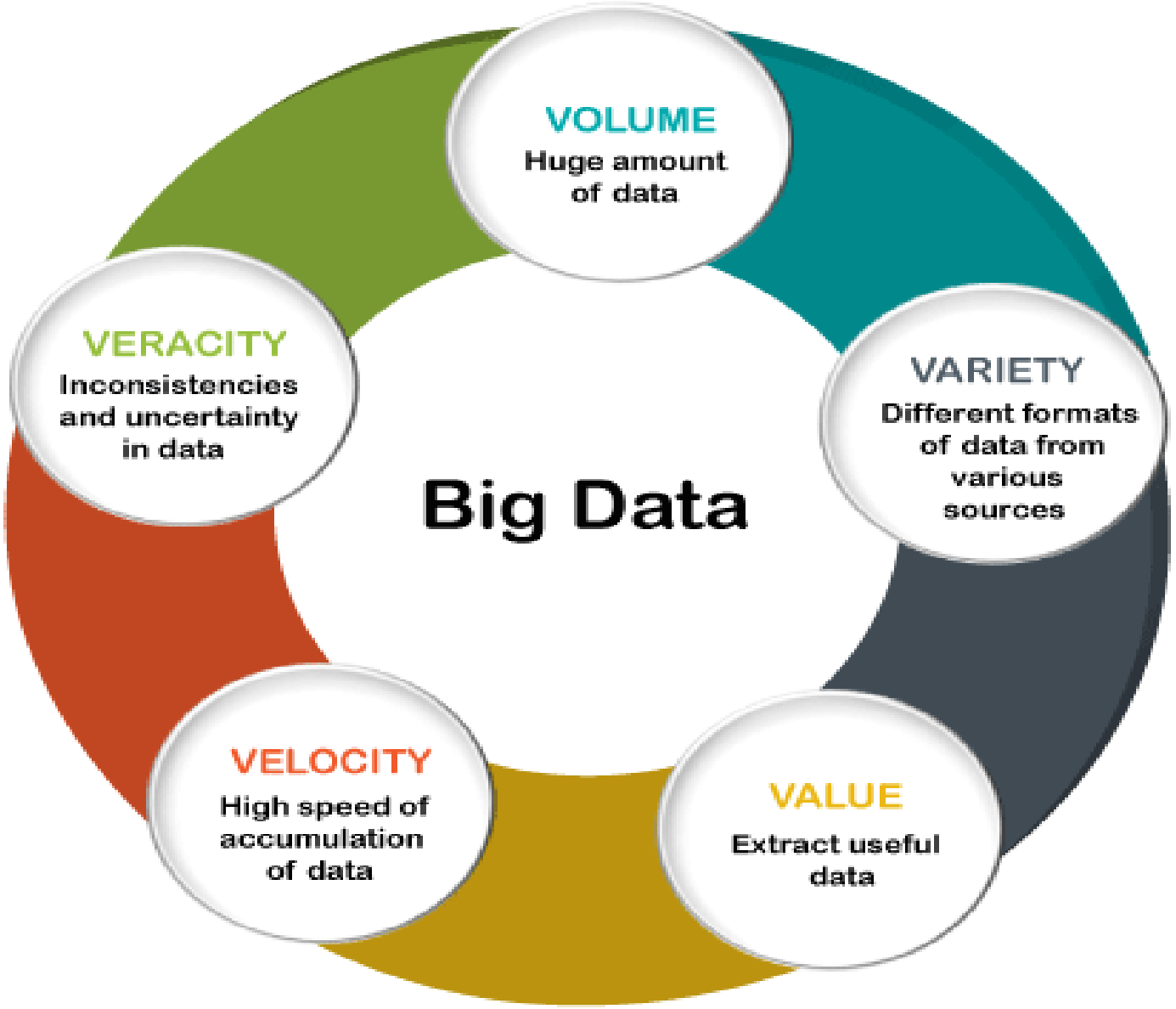
Data Usage

- covers the data-driven business activities that need access to data, its analysis, and the tools needed to integrate the data analysis within the business activity. Data usage in business decision-making can enhance competitiveness through reduction of costs, increased added value, or any other parameter that can be measured against existing performance criteria. Chapter 7 contains a detailed examination of data usage.

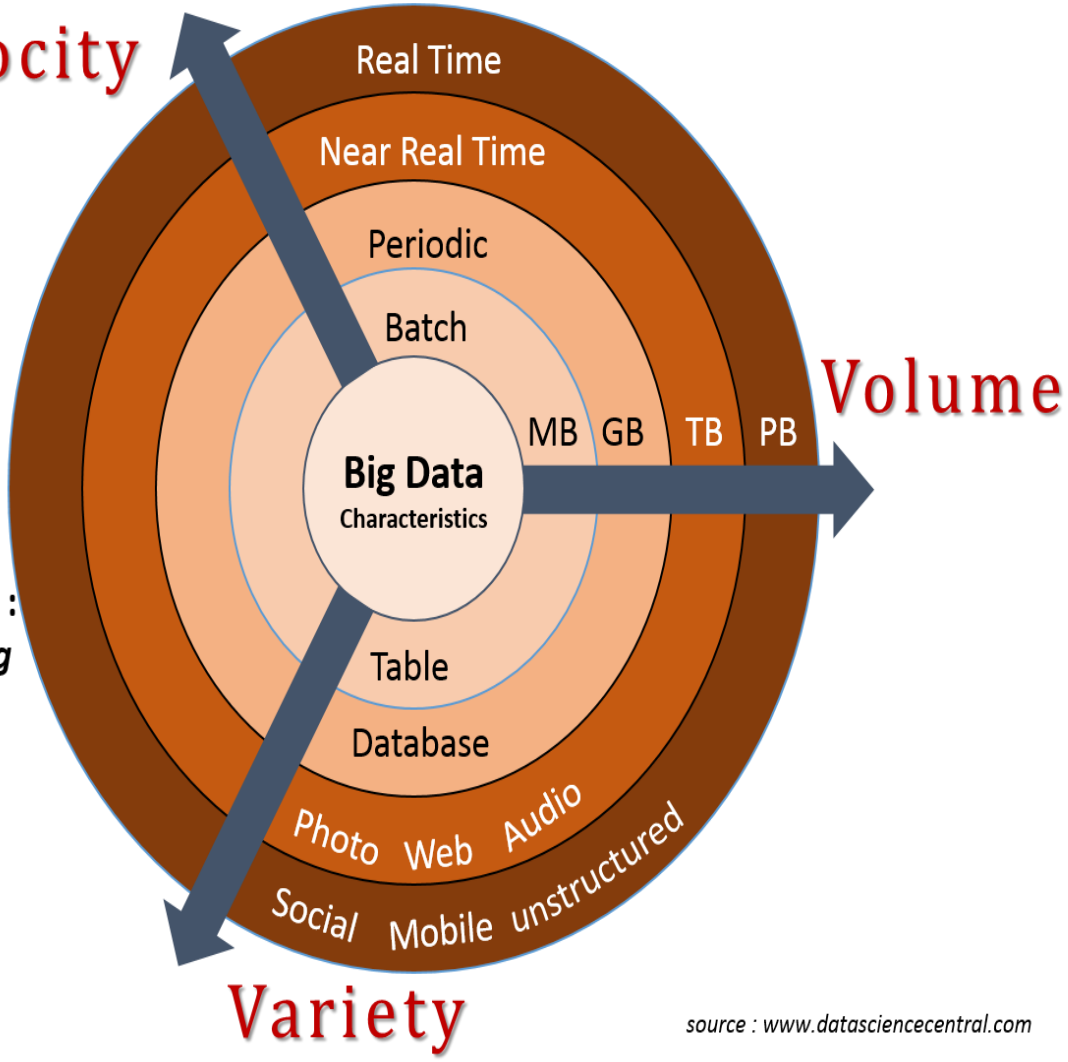
Basic concepts of Big Data




BIG DATA
Facebook
Whatsapp
Online Shopping
Smart Phones
Youtube
Emails
Twitter
Cloud Computing
Media
Log Files
Sensors


VOLUME
Huge amount of data
VARIETY
Different formats of data from various sources
VALUE
Extract useful data
VELOCITY
High speed of accumulation of data
VERACITY
Inconsistencies and uncertainty in data
Big Data

Big Data Characteristics : ***Ever Expanding horizon***



source : www.datasciencecentral.com

BIG DATA!!!!!!

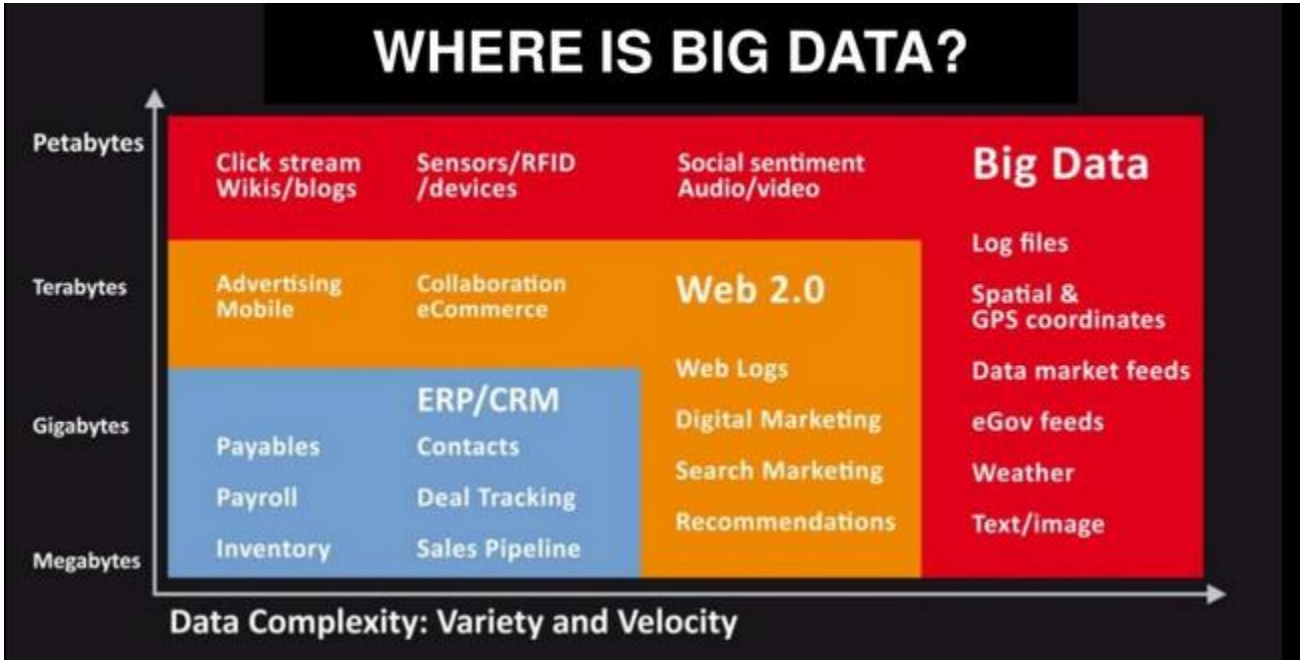
How big is BIG?

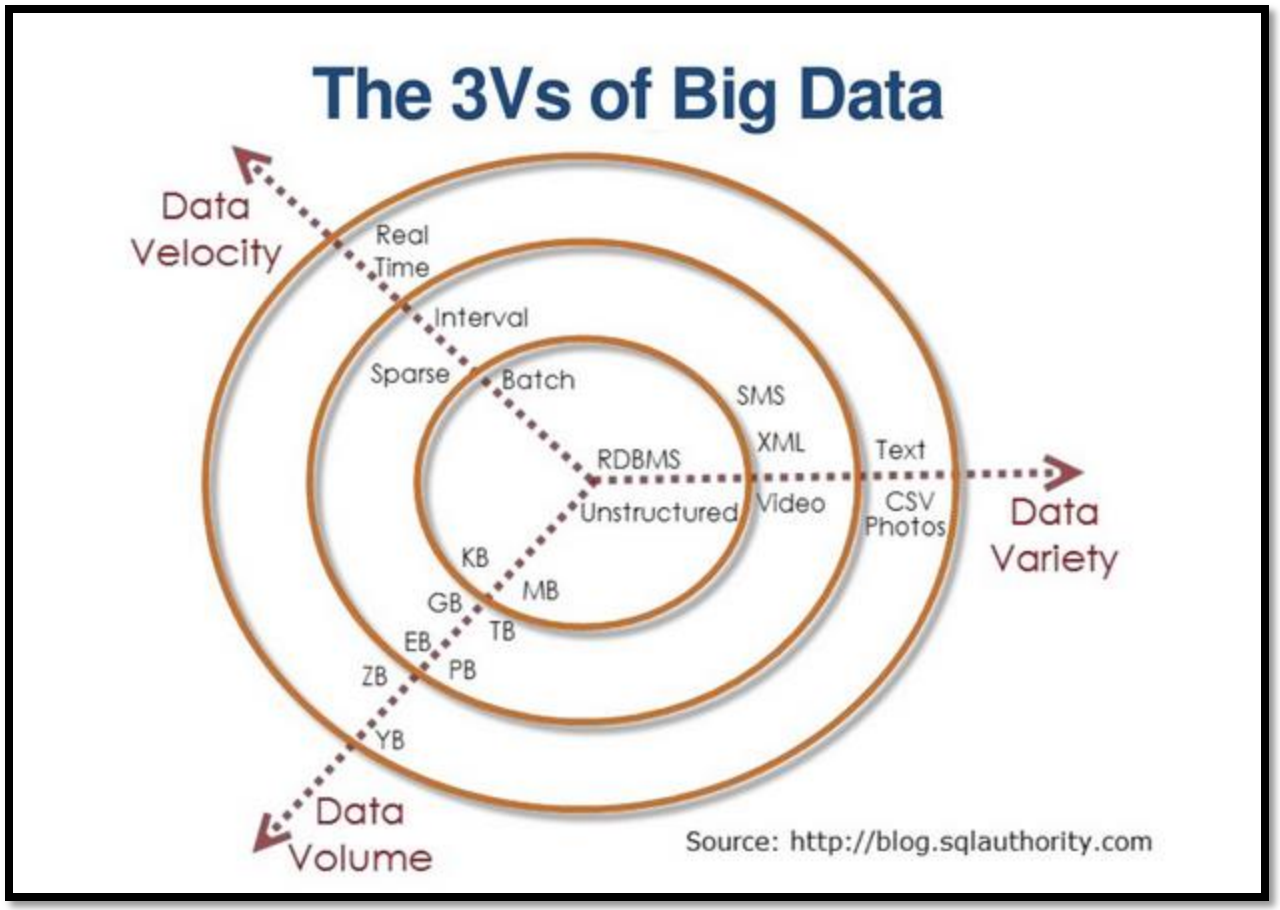
Twitter users send out **277,000** tweets **EVERY MINUTE**

Facebook processes **350GB** of data

100 hours of new video are uploaded on YouTube

Google processes more than **2 million** seach queries




The 3Vs of Big Data
Data Velocity
Real Time
Interval
Sparse
Batch
SMS
XML
Text
RDBMS
Unstructured
Video
CSV
Photos
Data Variety
KB
MB
GB
TB
EB
PB
ZB
YB
Data Volume
Source: http://blog.sqlauthority.com

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Designing for Emerging Technologies: UX for Genomics, Robotics, and the Internet of Things	Follett, J.	O'Reilly Media	2014
2	Emerging Technologies for Emerging Markets	Vong, J., & Song, I.	Springer Singapore	2014
3	Disruption: Emerging Technologies and the Future of Work	Del Rosal, V.	Emtechub.	2015
4	Emerging Internet-Based Technologies	Sadiku, M. N. O	CRC Press	2019
	Reference Books			
1	Digital Economy. Emerging Technologies and Business Innovation	Mohamed Anis Bach Tobji, Rim Jallouli, Yamen Koubaa, Anton Nijholt	-	2018
2	Virtual & Augmented Reality for Dummies	Paul Mealy,	-	2018
3	Augmented Reality and Virtual Reality: Empowering Human, Place and Business	Timothy Jung, M. Claudia tom Dieck	-	2019

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Emerging Exponential Technologies

20MBA301

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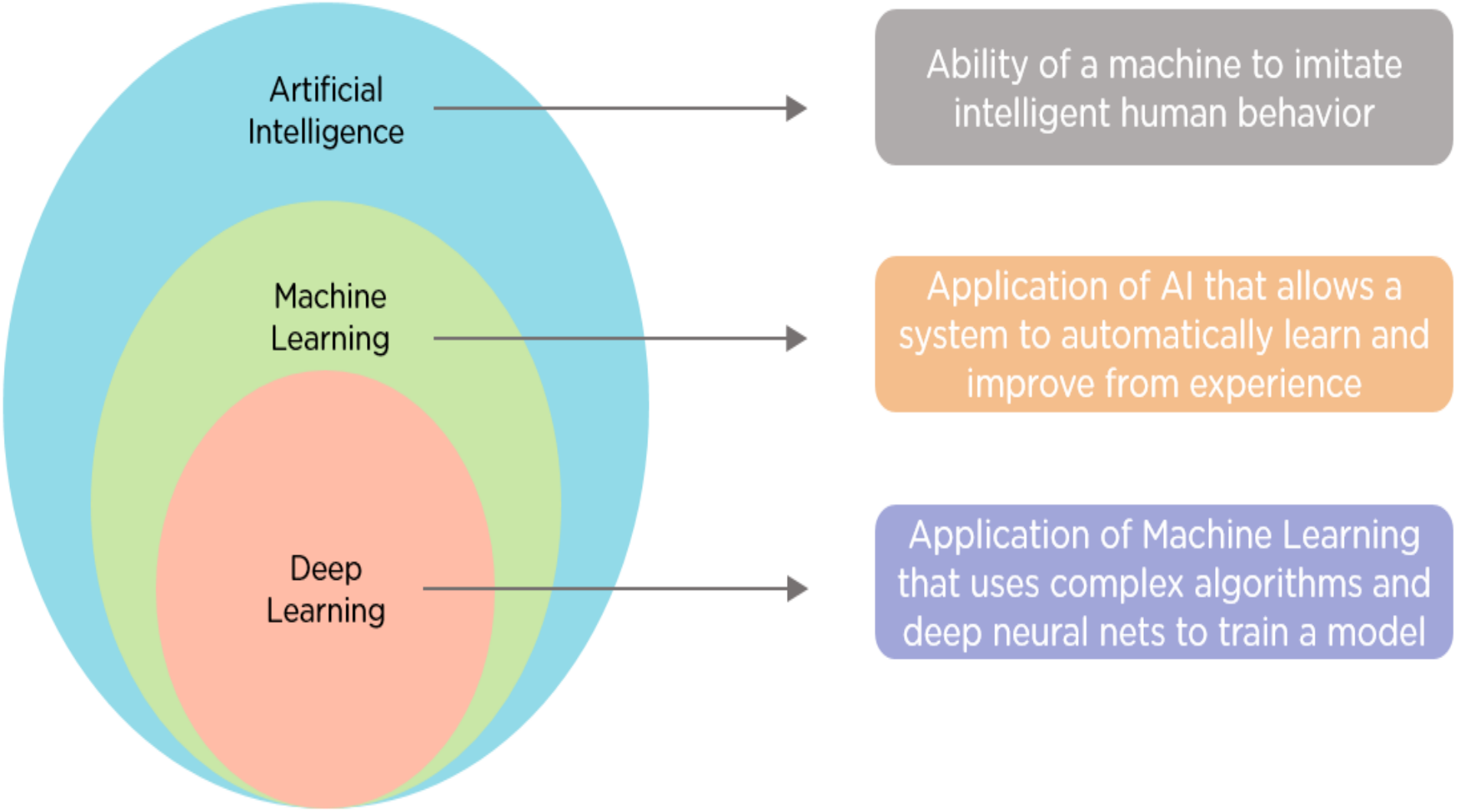
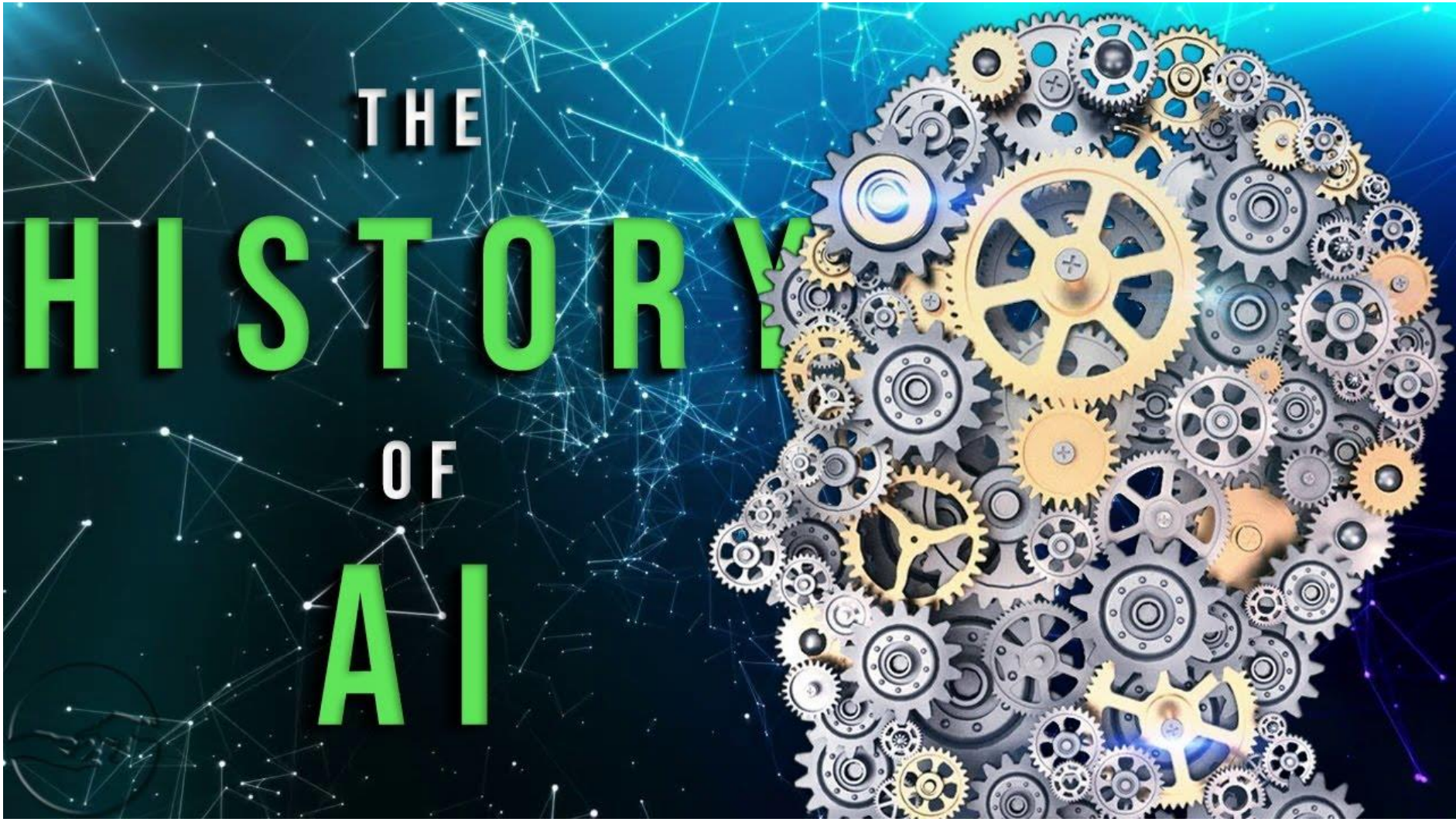
Module -3 Artificial Intelligence(AI)


Artificial Intelligence
Machine Learning
Deep Learning
Ability of a machine to imitate intelligent human behavior
Application of AI that allows a system to automatically learn and improve from experience
Application of Machine Learning that uses complex algorithms and deep neural nets to train a model

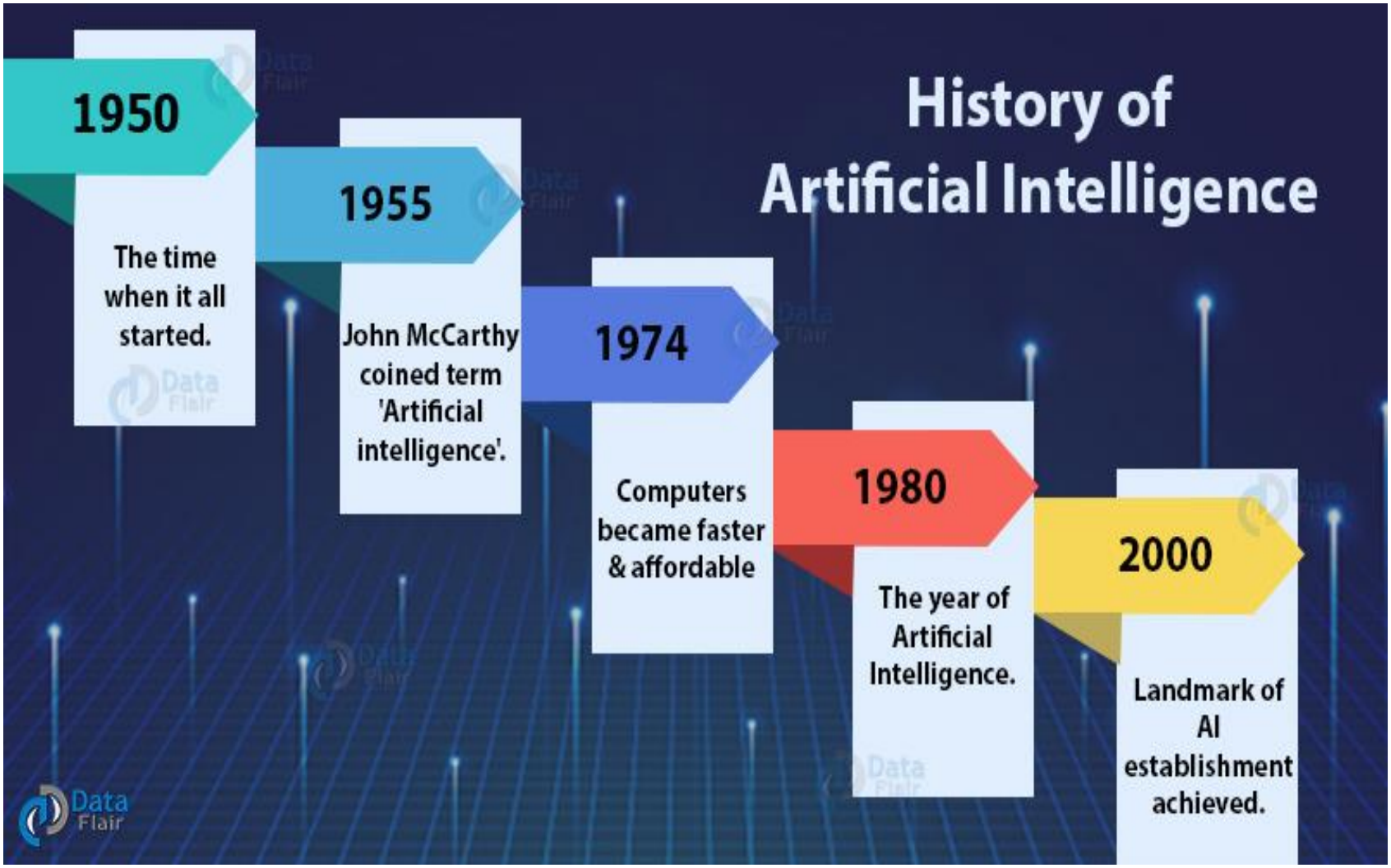
Meaning

- Artificial intelligence is **the simulation of human intelligence processes by machines**, especially computer systems. Specific applications of AI include expert systems, natural language processing, speech recognition
- (1956) The phrase artificial intelligence is coined at the "Dartmouth Summer Research Project on Artificial Intelligence." Led by **John McCarthy**, the conference, which defined the scope and goals of AI, is widely considered to be the birth of artificial intelligence as we know it today.d machine vision.


THE
HISTORY
OF
AI

History of AI

- AI was a term first coined at Dartmouth College in 1956. Cognitive scientist Marvin Minsky was optimistic about the technology's future. The 1974-1980 saw government funding in the field drop, a period known as "AI winter", when several criticised progress in the field.
-
- However, the fervour was revived afterwards in the 1980s when the British government started funding the technology again, especially because they were worried about competition with the Japanese. In 1997, IBM's Deep Blue began the first computer to beat a Russian Grandmaster, making history.
- https://youtu.be/2ocqw6GSQTM


History of Artificial Intelligence
1950
The time when it all started.
1955
John McCarthy coined term 'Artificial intelligence'.
1974
Computers became faster & affordable
1980
The year of Artificial Intelligence.
2000
Landmark of AI establishment achieved.
Data Flair

A.I. TIMELINE

1950
TURING TEST
Computer scientist Alan Turing proposes a test for machine intelligence. If a machine can trick humans into thinking it is human, then it has intelligence

1955
A.I. BORN
Term 'artificial intelligence' is coined by computer scientist, John McCarthy to describe "the science and engineering of making intelligent machines"

1961
UNIMATE
First industrial robot, Unimate, goes to work at GM replacing humans on the assembly line

1964
ELIZA
Pioneering chatbot developed by Joseph Weizenbaum at MIT holds conversations with humans

1966
SHAKEY
The 'first electronic person' from Stanford, Shakey is a general-purpose mobile robot that reasons about its own actions

A.I. WINTER
Many false starts and dead-ends leave A.I. out in the cold

1997
DEEP BLUE
Deep Blue, a chess-playing computer from IBM defeats world chess champion Garry Kasparov

1998
KISMET
Cynthia Breazeal at MIT introduces KISmet, an emotionally intelligent robot insofar as it detects and responds to people's feelings

1999
AIBO
Sony launches first consumer robot pet dog AiBO (AI robot) with skills and personality that develop over time

2002
ROOMBA
First mass produced autonomous robotic vacuum cleaner from iRobot learns to navigate and clean homes

2011
SIRI
Apple integrates Siri, an intelligent virtual assistant with a voice interface, into the iPhone 4S

2011
WATSON
IBM's question answering computer Watson wins first place on popular $1M prize television quiz show *Jeopardy*

2014
EUGENE
Eugene Goostman, a chatbot passes the Turing Test with a third of judges believing Eugene is human

2014
ALEXA
Amazon launches Alexa, an intelligent virtual assistant with a voice interface that completes shopping tasks

2016
TAY
Microsoft's chatbot Tay goes rogue on social media making inflammatory and offensive racist comments

2017
ALPHAGO
Google's A.I. AlphaGo beats world champion Ke Jie in the complex board game of Go, notable for its vast number (2^{170}) of possible positions

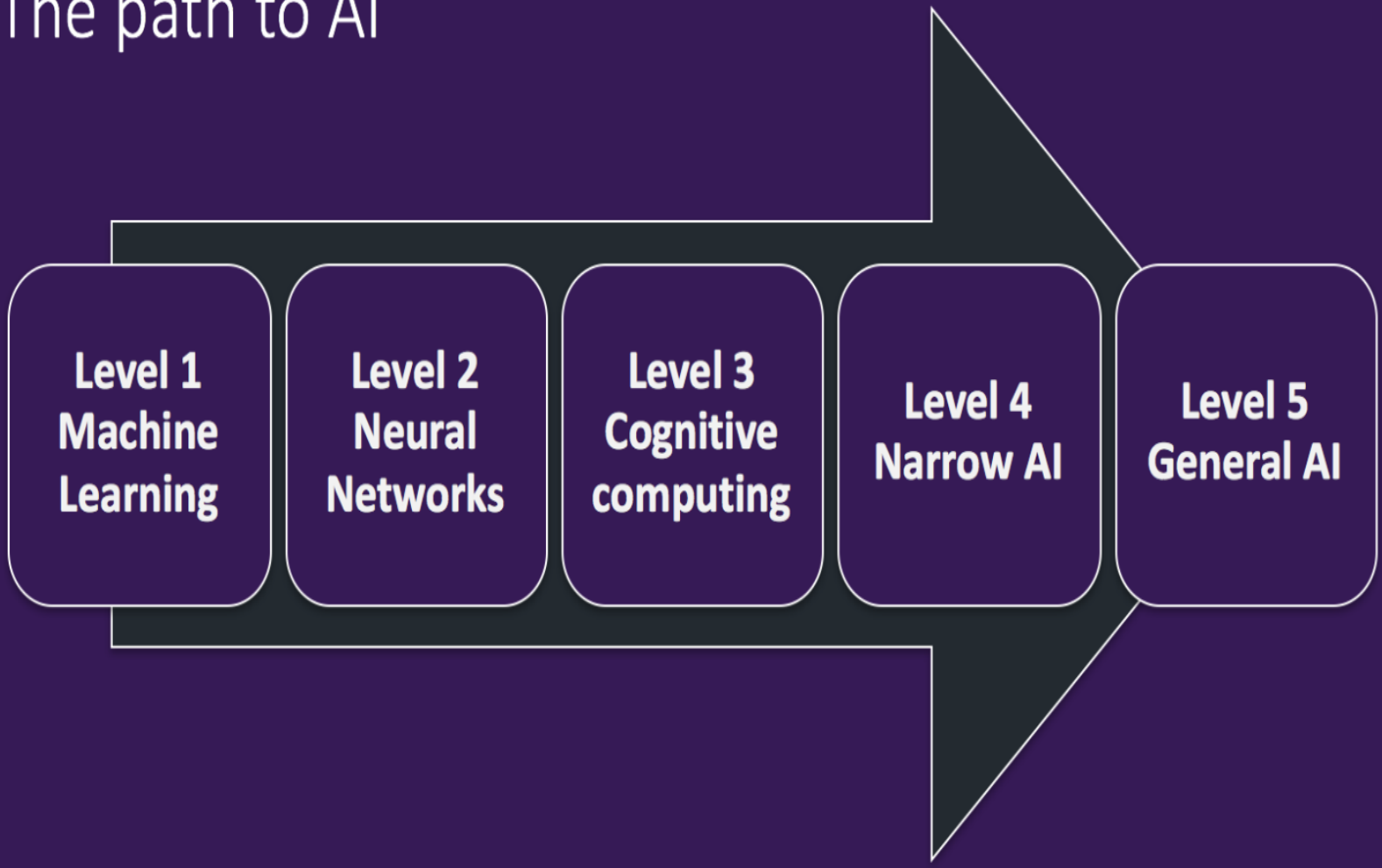
- The field of AI research was founded at a workshop held on the campus of Dartmouth College during the summer of 1956.[1] Those who attended would become the leaders of AI research for decades. Many of them predicted that a machine as intelligent as a human being would exist in no more than a generation, and they were given millions of dollars to make this vision come true.[2]
- Eventually, it became obvious that commercial developers and researchers had grossly underestimated the difficulty of the project.[3] In 1973, in response to the criticism from James Lighthill and ongoing pressure from congress, the U.S. and British Governments stopped funding undirected research into artificial intelligence, and the difficult years that followed would later be known as an "AI winter".

- Seven years later, a visionary initiative by the Japanese Government inspired governments and industry to provide AI with billions of dollars, but by the late 80s the investors became disillusioned and withdrew funding again.
- Investment and interest in AI boomed in the first decades of the 21st century when machine learning was successfully applied to many problems in academia and industry due to new methods, the application of powerful computer hardware, and the collection of immense data sets.

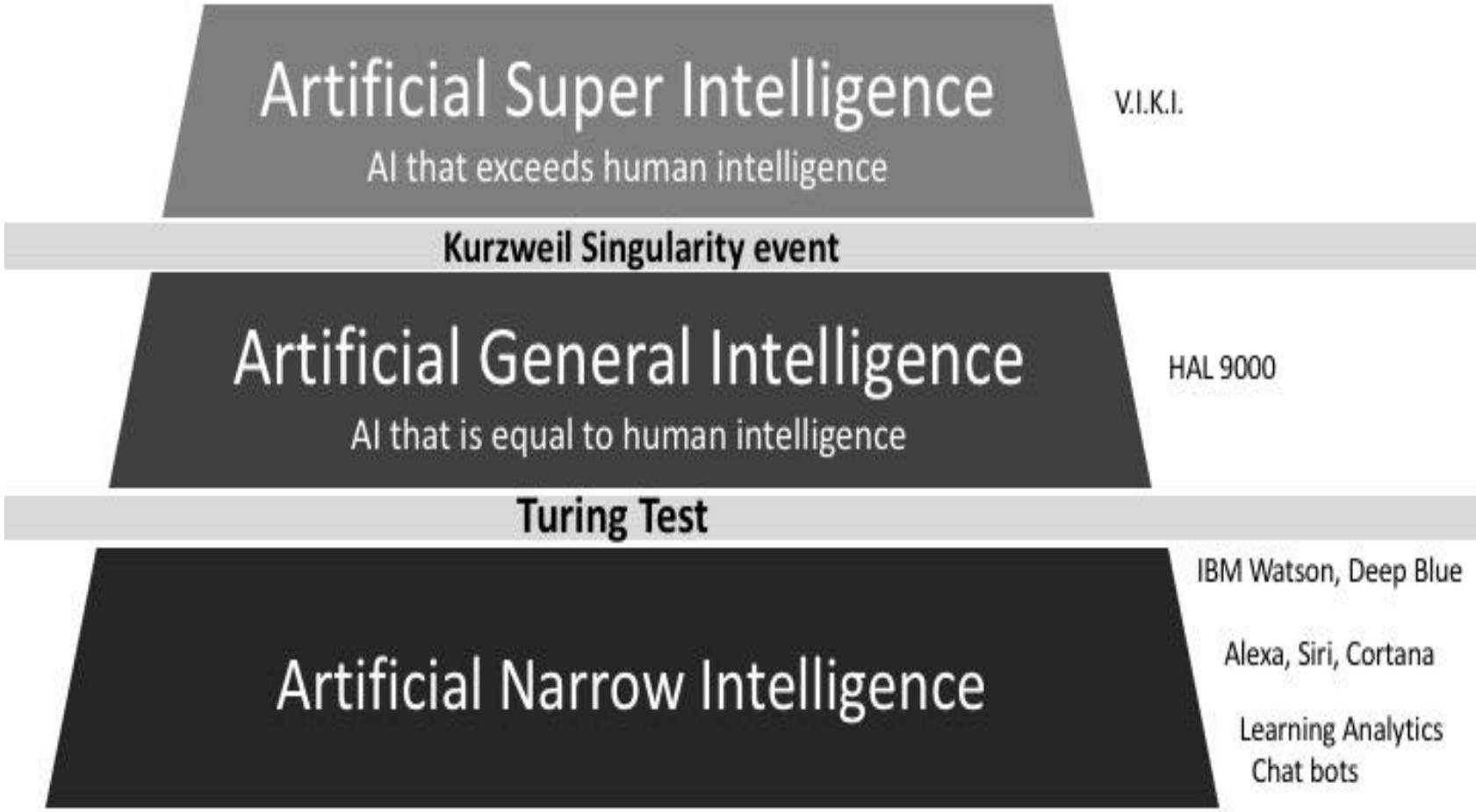
Levels of AI

Level 5	Fully automated system which never requires human intervention
Level 4	Automation - A public service runs itself unless it hits an extreme case where it requires human intervention
Level 3	Semi-autonomous - Computers monitoring and running e.g. a regulatory system
Level 2	Close supervision - Routine administration of systems e.g. energy networks with difficult decisions referred to a human
Level 1	Simple augmentation - data entry, processing, Identifying clusters of activity, profiling, etc e.g. in fraud detection
Level 0	No automation - people powered public services

The path to AI



Levels of Artificial Intelligence

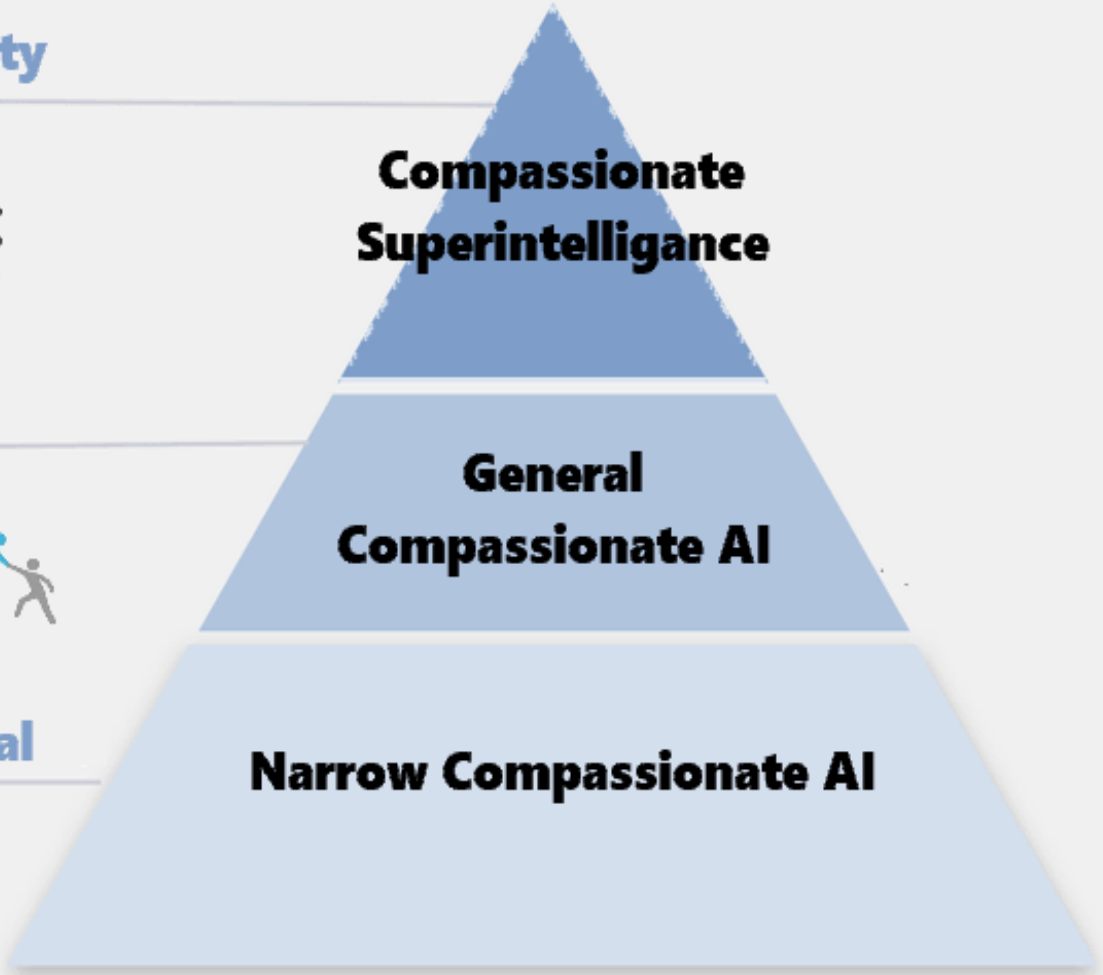


Graphic concept by Steve Wheeler (2019) - adapted from various sources

Satge - 3: Humanity

Satge - 2: Social

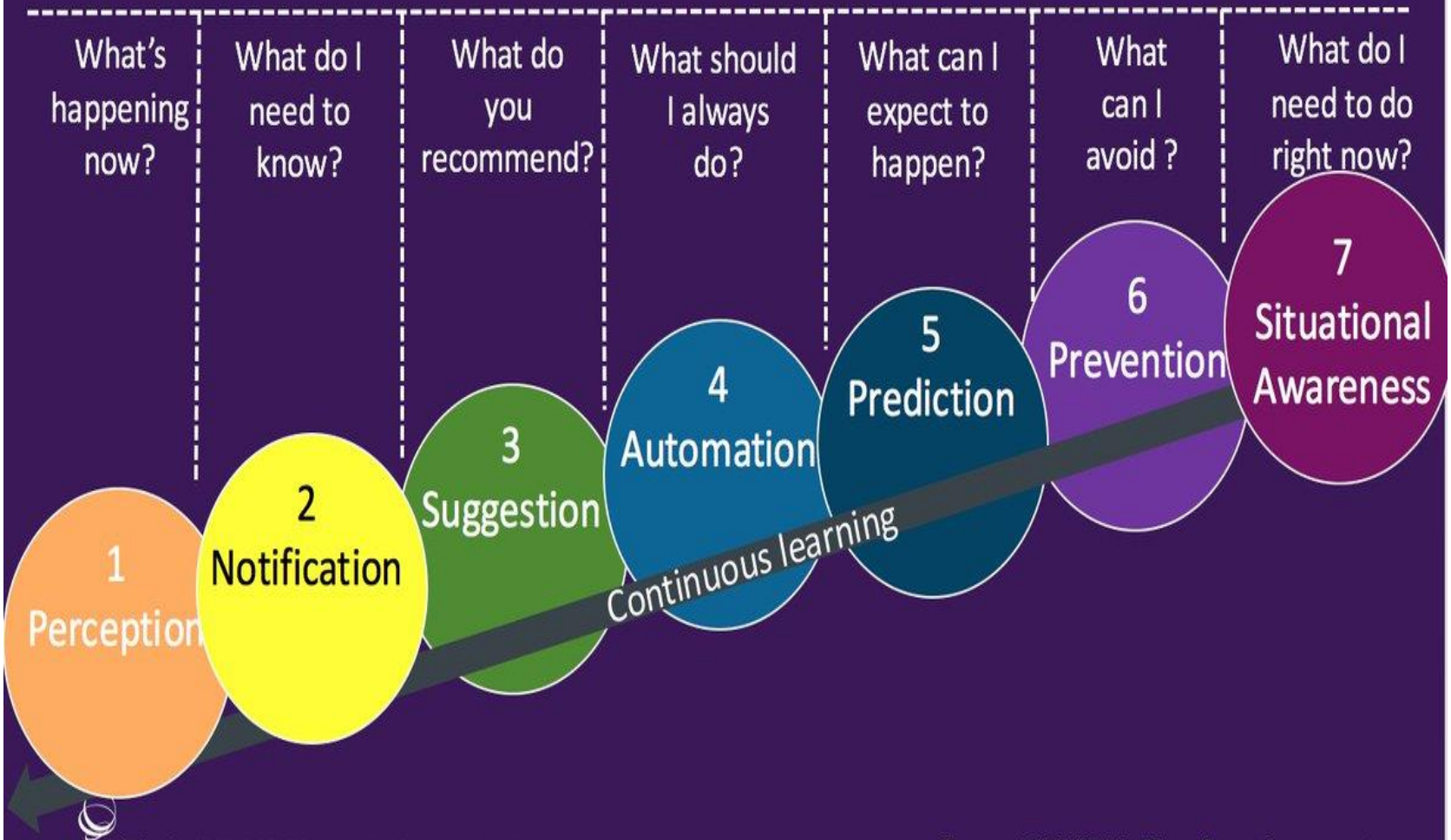
Satge - 1: Individual



www.amitray.com

Three Levels of Compassionate AI

The seven levels of AI maturity



	 Level 1	 Level 2	 Level 3	 Level 4
Names	**Efficiency**	**Personalization**	**Reasoning**	**Exploration**
Definitions	AI **facilitates** specific functions with systems and devices, making user interactions more efficient and effective	AI uses **pattern learning** to recognize, optimize and personalize functions in order to improve and simplify interactions for users	AI uses **causality learning** to understand the cause of certain patterns and behaviours, this information is used to predict and promote positive outcomes for users	AI uses **experimental learning** to continuously improve, by forming and testing hypotheses it uncovers new inferences, seamlessly adding value to users' lives and enabling a deeper affinity
Pervasiveness In Our Lives	**Familiar** Systems and devices that utilize AI are appearing in user's everyday lives	**Common** AI is optimizing most devices at the edge and most systems through the cloud	**Universal** AI is everywhere and interconnected for the benefit of all devices and systems	**Foundational** AI forms a core component of the infrastructure for all devices and systems in society which share and learn collectively

- AI is divided broadly into three stages: **artificial narrow intelligence (ANI), artificial general intelligence (AGI) and artificial super intelligence (ASI)**.

- **Artificial narrow intelligence** (ANI), which has a narrow range of abilities;
- **Artificial general intelligence** (AGI), which is on par with human capabilities; or
- **Artificial superintelligence** (ASI), which is more capable than a human.

- Narrow AI has experienced numerous breakthroughs in the last decade, powered by achievements in machine learning and deep learning. For example, AI systems today are used in medicine to diagnose cancer and other diseases with extreme accuracy through replication of human-esque cognition and reasoning.
- Narrow AI's machine intelligence comes from the use of natural language processing (NLP) to perform tasks. NLP is evident in chatbots and similar AI technologies. By understanding speech and text in natural language, AI is programmed to interact with humans in a natural, personalised manner.

Examples of narrow AI

- Rankbrain by Google / Google Search
- Siri by Apple, Alexa by Amazon, Cortana by Microsoft and other virtual assistants
- IBM's Watson
- Image / facial recognition software
- Disease mapping and prediction tools
- Manufacturing and drone robots
- Email spam filters / social media monitoring tools for dangerous content
- Entertainment or marketing content recommendations based on watch/listen/purchase behaviour
- Self-driving cars

- Artificial general intelligence (AGI), also referred to as strong AI or deep AI, is the concept of a machine with general intelligence that mimics human intelligence and/or behaviours, with the ability to learn and apply its intelligence to solve any problem. AGI can think, understand, and act in a way that is indistinguishable from that of a human in any given situation.
- AI researchers and scientists have not yet achieved strong AI. To succeed, they would need to find a way to make machines conscious, programming a full set of cognitive abilities. Machines would have to take experiential learning to the next level, not just improving efficiency on singular tasks, but gaining the ability to apply experiential knowledge to a wider range of different problems.

- Fujitsu-built K, one of the fastest supercomputers, is one of the most notable attempts at achieving strong AI, but considering **it took 40 minutes to simulate a single second of neural activity**, it is difficult to determine whether or not strong AI will be achieved in our foreseeable future. As image and facial recognition technology advances, it is likely we will see an improvement in the ability of machines to learn and see.

- Artificial super intelligence (ASI), is the hypothetical AI that doesn't just mimic or understand human intelligence and behaviour; ASI is where machines become self-aware and surpass the capacity of human intelligence and ability.
- Super intelligence has long been the muse of dystopian science fiction in which robots overrun, overthrow, and/or enslave humanity. The concept of artificial super intelligence sees AI evolve to be so akin to human emotions and experiences, that it doesn't just understand them, it evokes emotions, needs, beliefs and desires of its own.

- In addition to replicating the multi-faceted intelligence of human beings, ASI would theoretically be exceedingly better at everything we do; math, science, sports, art, medicine, hobbies, emotional relationships, everything. ASI would have a greater memory and a faster ability to process and analyze data and stimuli. Consequently, the decision-making and problem solving capabilities of super intelligent beings would be far superior than those of human beings.

TYPES OF AI

REACTIVE

Has no memory, only responds to different stimuli

LIMITED MEMORY

Uses memory to learn and improve its responses

THEORY OF MIND

Understands the needs of other intelligent entities

SELF-AWARE

Has human-like intelligence and self-awareness

1. Reactive Machines

- These are the oldest forms of AI systems that have extremely limited capability. They emulate the human mind's ability to respond to different kinds of stimuli. These machines do not have memory-based functionality.
- This means such machines cannot use previously gained experiences to inform their present actions, i.e., these machines do not have the ability to "learn."
- These machines could only be used for automatically responding to a limited set or combination of inputs. They cannot be used to rely on memory to improve their operations based on the same.
- A popular example of a reactive AI machine is IBM's Deep Blue, a machine that beat chess Grandmaster Garry Kasparov in 1997.

2. Limited Memory

- Limited memory machines are machines that, in addition to having the capabilities of purely reactive machines, are also capable of learning from historical data to make decisions. Nearly all existing applications that we know of come under this category of AI. All present-day AI systems, such as those using deep learning, are trained by large volumes of training data that they store in their memory to form a reference model for solving future problems.

- For instance, an image recognition AI is trained using thousands of pictures and their labels to teach it to name objects it scans.
- When an image is scanned by such an AI, it uses the training images as references to understand the contents of the image presented to it, and based on its “learning experience” it labels new images with increasing accuracy.

- Almost all present-day AI applications, from chatbots and virtual assistants to self-driving vehicles are all driven by limited memory AI.

3. Theory of Mind

- While the previous two types of AI have been and are found in abundance, the next two types of AI exist, for now, either as a concept or a work in progress. Theory of mind AI is the next level of AI systems that researchers are currently engaged in innovating.

- A theory of mind level AI will be able to better understand the entities it is interacting with by discerning their needs, emotions, beliefs, and thought processes. While artificial emotional intelligence is already a budding industry and an area of interest for leading AI researchers, achieving Theory of mind level of AI will require development in other branches of AI as well.

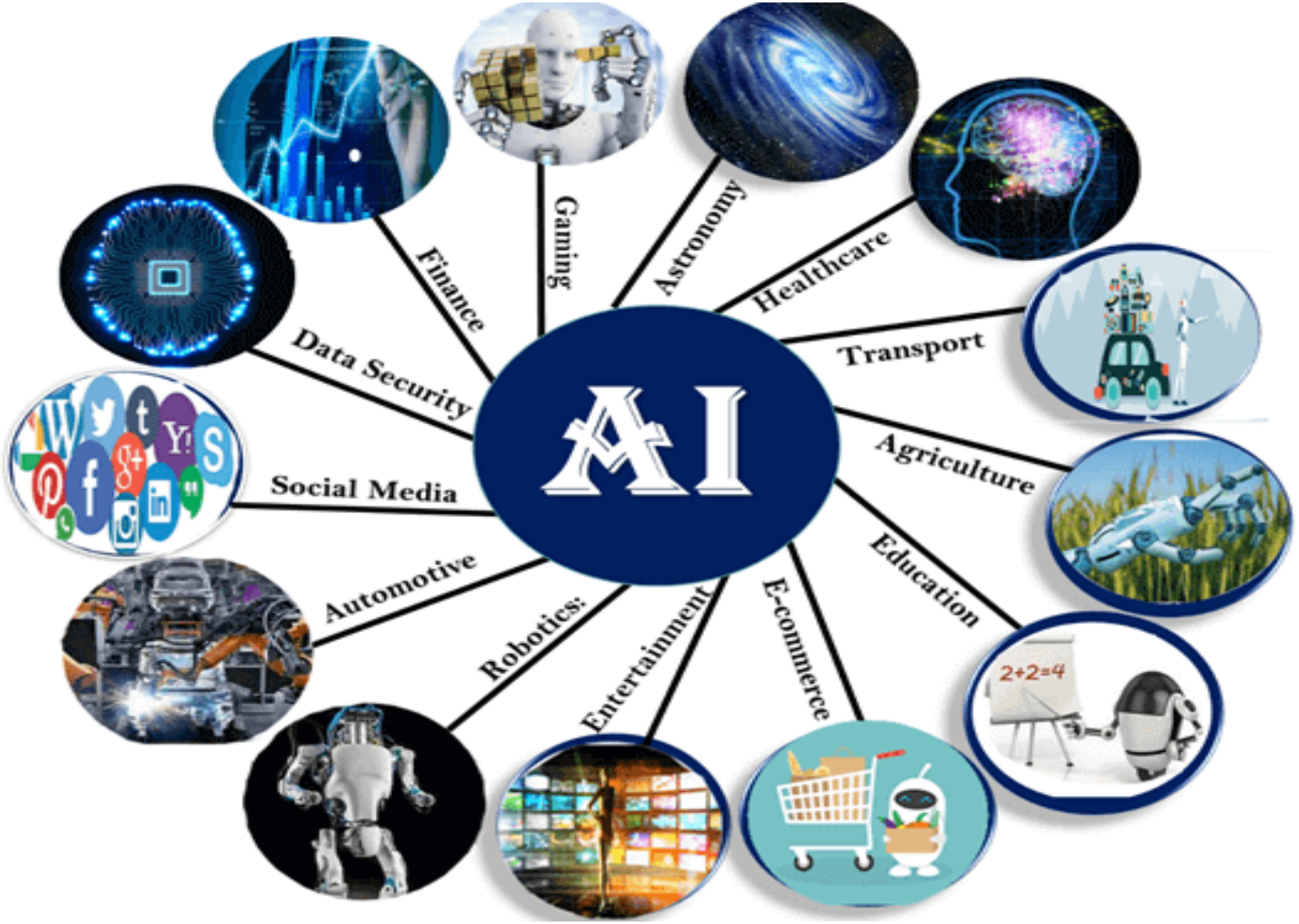
- This is because to truly understand human needs, AI machines will have to perceive humans as individuals whose minds can be shaped by multiple factors, essentially “understanding” humans.

4. Self-aware

- Self-aware AI, which, self explanatorily, is an AI that has evolved to be so akin to the human brain that it has developed self-awareness. Creating this type of Ai, which is decades, if not centuries away from materializing, is and will always be the ultimate objective of all AI research.

- This type of AI will not only be able to understand and evoke emotions in those it interacts with, but also have emotions, needs, beliefs, and potentially desires of its own. And this is the type of AI that doomsayers of the technology are wary of.

- Although the development of self-aware can potentially boost our progress as a civilization by leaps and bounds, it can also potentially lead to catastrophe.
- This is because once self-aware, the AI would be capable of having ideas like self-preservation which may directly or indirectly spell the end for humanity, as such an entity could easily outmaneuver the intellect of any human being and plot elaborate schemes to take over humanity.


AI
Finance
Gaming
Astronomy
Healthcare
Transport
Agriculture
Education
E-commerce
Entertainment
Robotics:
Automotive
Social Media
Data Security
2+2=4

AI in Healthcare

- AI in healthcare is often used for classification, whether to automate initial evaluation of a CT scan or EKG or to identify high-risk patients for population health.
- The breadth of applications is rapidly increasing. As an example, AI is being applied to the high-cost problem of dosage issues—where findings suggested that AI could save $16 billion. In 2016, a groundbreaking study in California found that a mathematical formula developed with the help of AI correctly determined the accurate dose of immunosuppressant drugs to give to organ patients


24°/18°
Percipitation 5%
1016 hPa
Soil temperature
50°
100%
75%
50%
pH 5.0
Moisture
60%

Analyzing crop health by drones

- **Precision Farming and Predictive Analytics:** AI applications in agriculture have developed applications and tools which help farmers inaccurate and controlled farming by providing them proper guidance to farmers about water management, crop rotation, timely harvesting, type of crop to be grown, optimum planting, pest attacks, nutrition management.

- **Agricultural Robotics:** AI companies are developing robots that can easily perform multiple tasks in farming fields. This type of robot is trained to control weeds and harvest crops at a faster pace with higher volumes compared to humans.
- **AI-enabled system to detect pests:** Pests are one of the worst enemies of the farmers which damages crops.
- AI systems use satellite images and compare them with historical data using AI algorithms and detect that if any insect has landed and which type of insect has landed like the locust, grasshopper, etc. And send alerts to farmers to their smartphones so that farmers can take required precautions and use required pest control thus AI helps farmers to fight against pests.

AI in Business

- https://www.ibm.com/in-en/analytics/put-ai-to-work?utm_content=SRCWW&p1=Search&p4=43700062002301428&p5=e&gclid=Cj0KCQjwrJOMBhCZARIsAGEd4VHucWgKVMqtyXs69kMeBCgoUlKvhNcL9QFxcI3nKcEGmeSRQdfNAPcaAkP1EALw_wcB&gclsrc=aw.ds

Applications of AI in business management include

- spam filters.
- smart email categorisation.
- voice to text features.
- smart personal assistants, such as Siri, Cortana and Google Now.
- automated responders and online customer support.
- process automation.
- sales and business forecasting.
- security surveillance.

Artificial intelligence in e-commerce

- smart searches and relevance features
- personalization as a service
- product recommendations and purchase predictions
- fraud detection and prevention for online transactions
- dynamic price optimization

Artificial intelligence in marketing

- recommendations and content curation
- personalization of news feeds
- pattern and image recognition
- language recognition - to digest unstructured data from customers and sales prospects
- ad targeting and optimized, real-time bidding
- customer segmentation
- social semantics and sentiment analysis
- automated web design
- predictive customer service

AI tools and platforms

- Microsoft Azure AI Platform. As a cloud platform, Microsoft Azure hardly needs an introduction. ...
- Google Cloud AI Platform. ...
- IBM Watson. ...
- Infosys Nia. ...
- Dialogflow. ...
- BigML.
-

- Scikit Learn.
- Tensorflow.
- Theano.
- Caffe.
- MxNet.
- Keras.
- PyTorch.
- CNTK.

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Designing for Emerging Technologies: UX for Genomics, Robotics, and the Internet of Things	Follett, J.	O'Reilly Media	2014
2	Emerging Technologies for Emerging Markets	Vong, J., & Song, I.	Springer Singapore	2014
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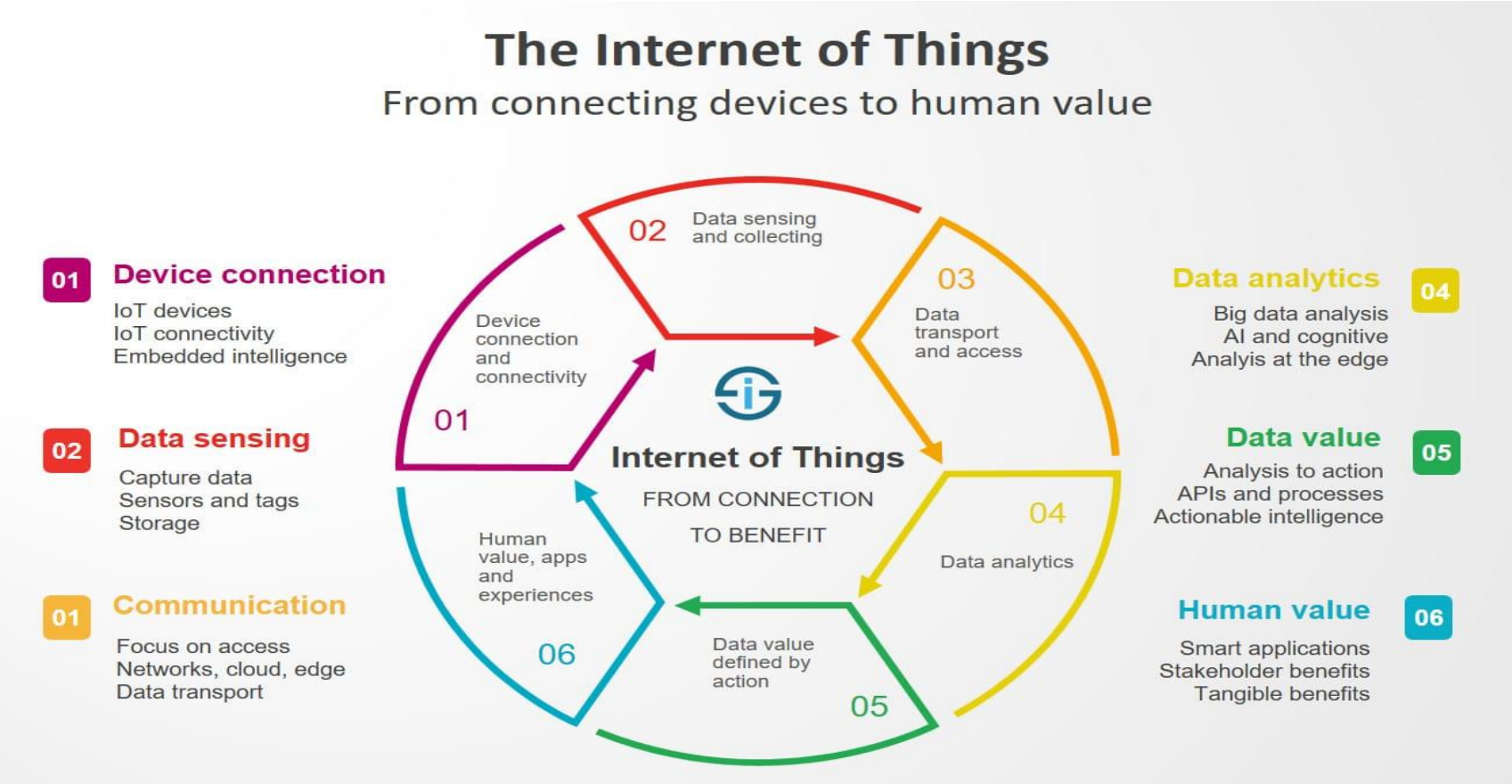
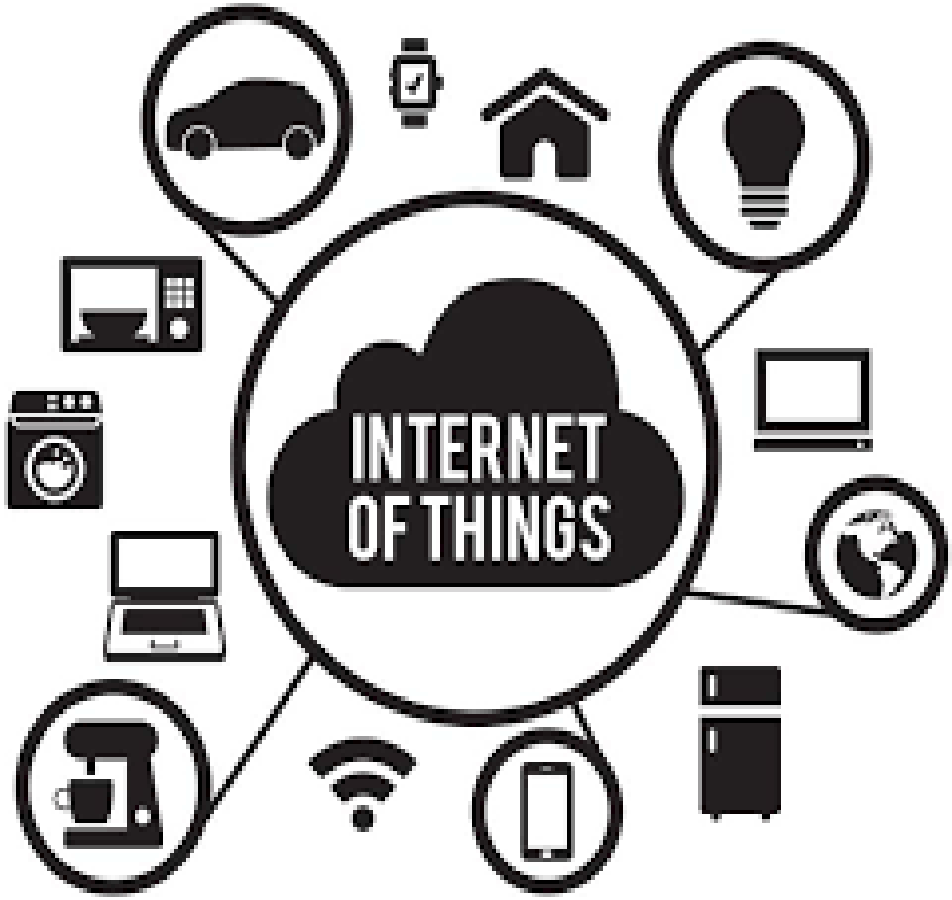
Internet of Things(IoT)

Overview of IOT: meaning of IOT; History of IOT; Advantages of IOT; Challenges of IOT; IOT working process; Architecture of IOT; Devices and network; Applications of IOT at Smart home; Smart grid; Smart city; Wearable devices; Smart farming; IOT tools and platforms; Sample application with hands on activity.

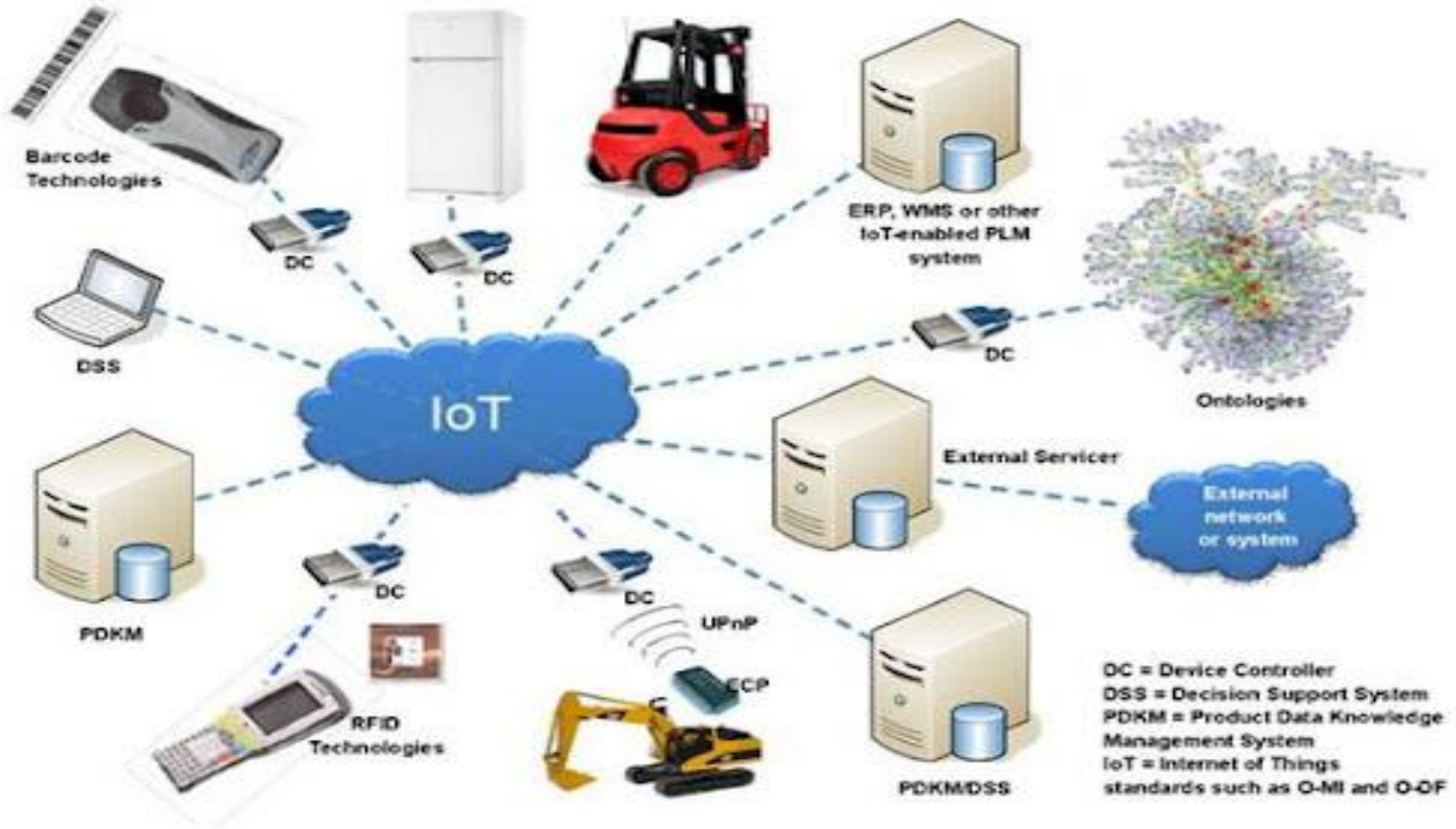
Overview of IOT

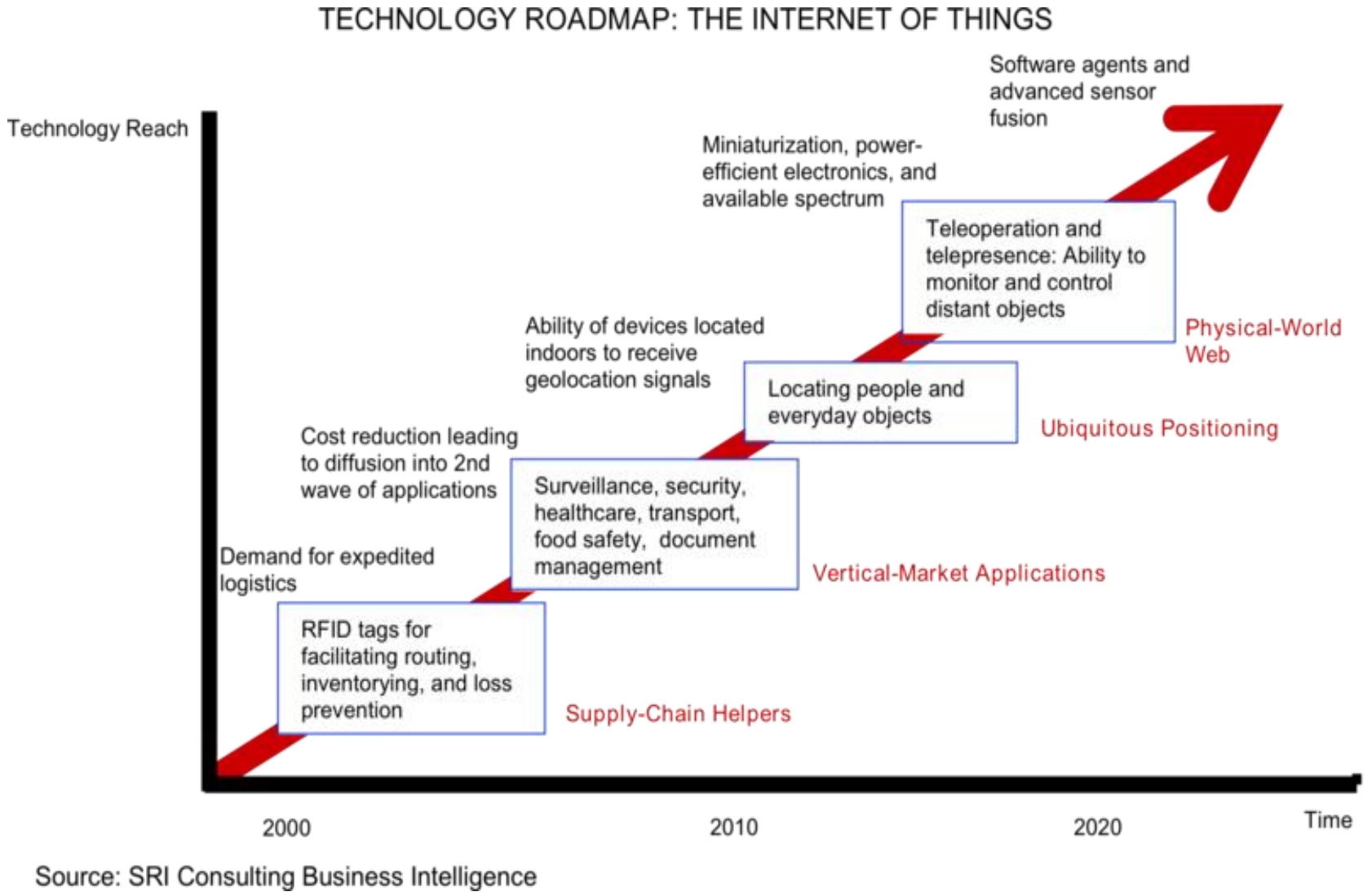


Overview of IOT



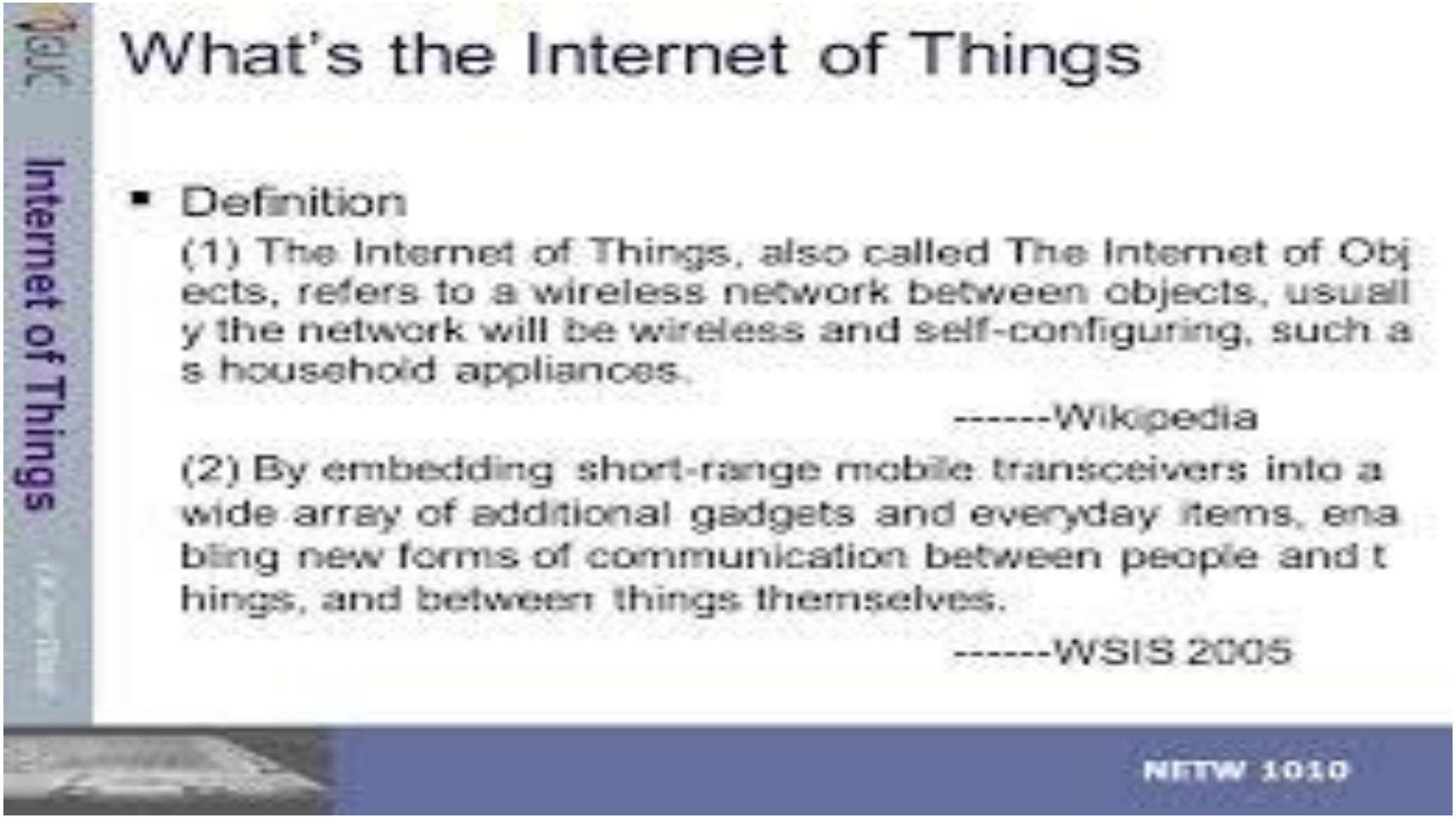
Overview of IOT





Source: SRI Consulting Business Intelligence

Overview of IOT

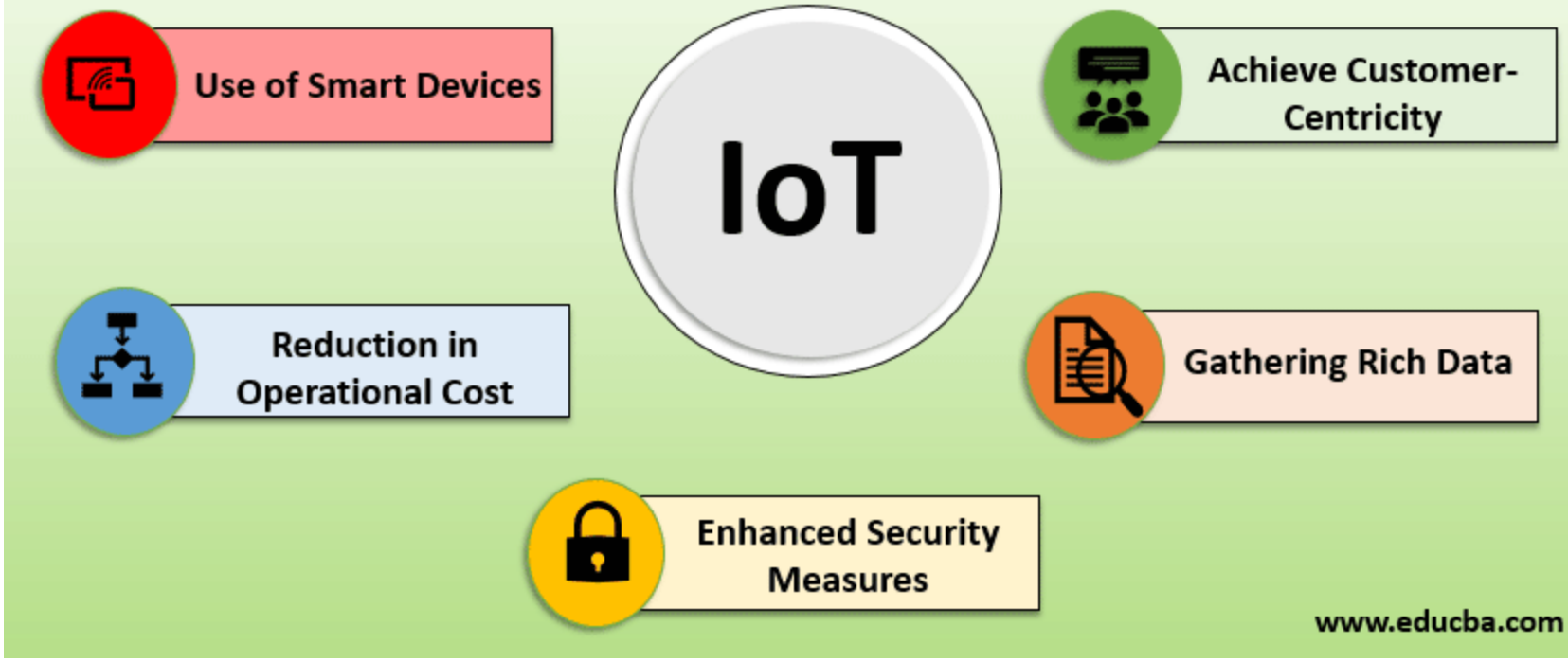


Overview of IOT

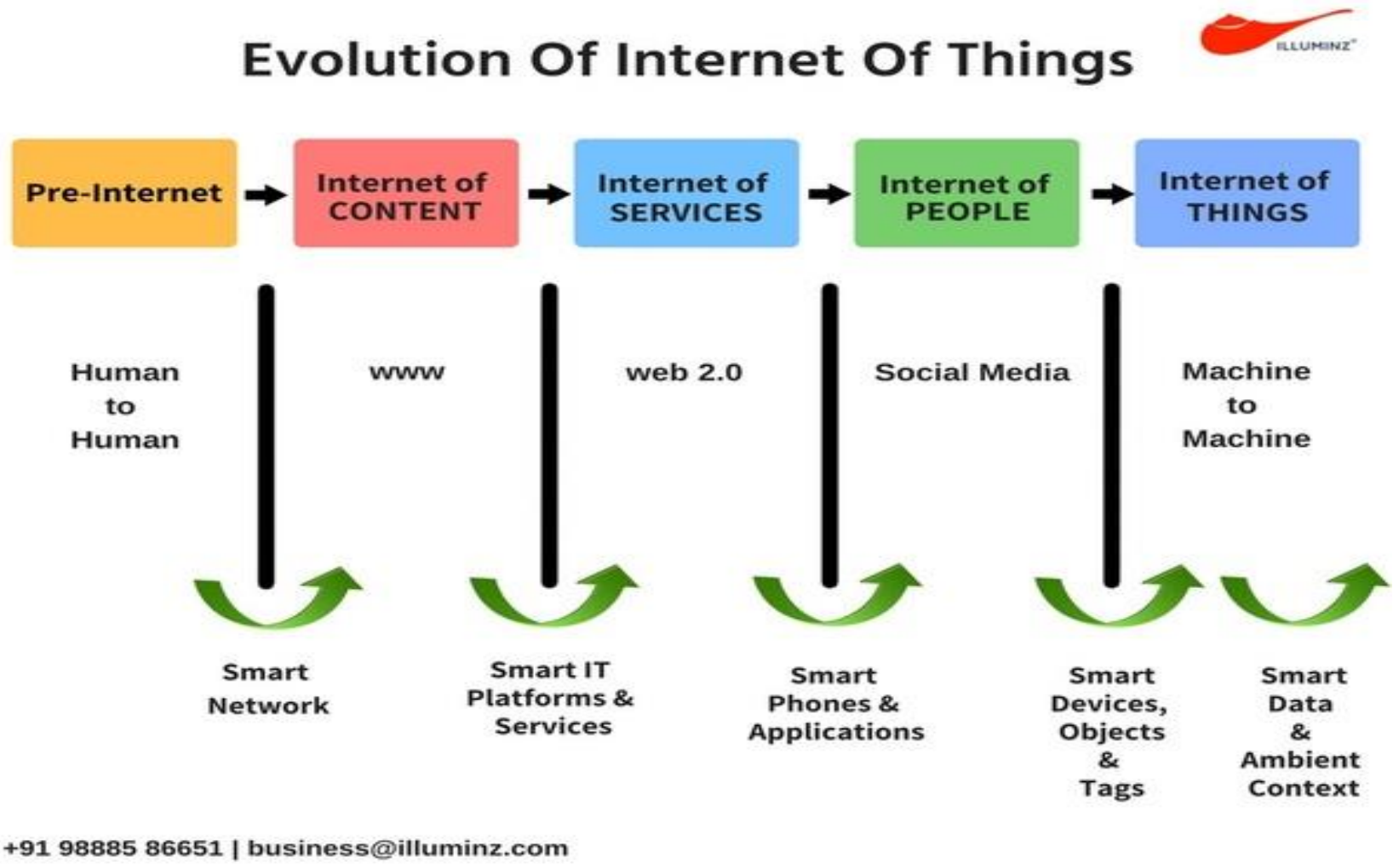
Introduction: Internet of Things (IoT)

- The **Internet of Things** is the network of physical objects—devices, vehicles, buildings and other items embedded with electronics, software, sensors, and network connectivity—that enables these objects to collect and exchange data.
- IoT is connecting every physical object in the world using wireless.
- **Internet of Things** are able to collect and exchange data using embedded sensors.

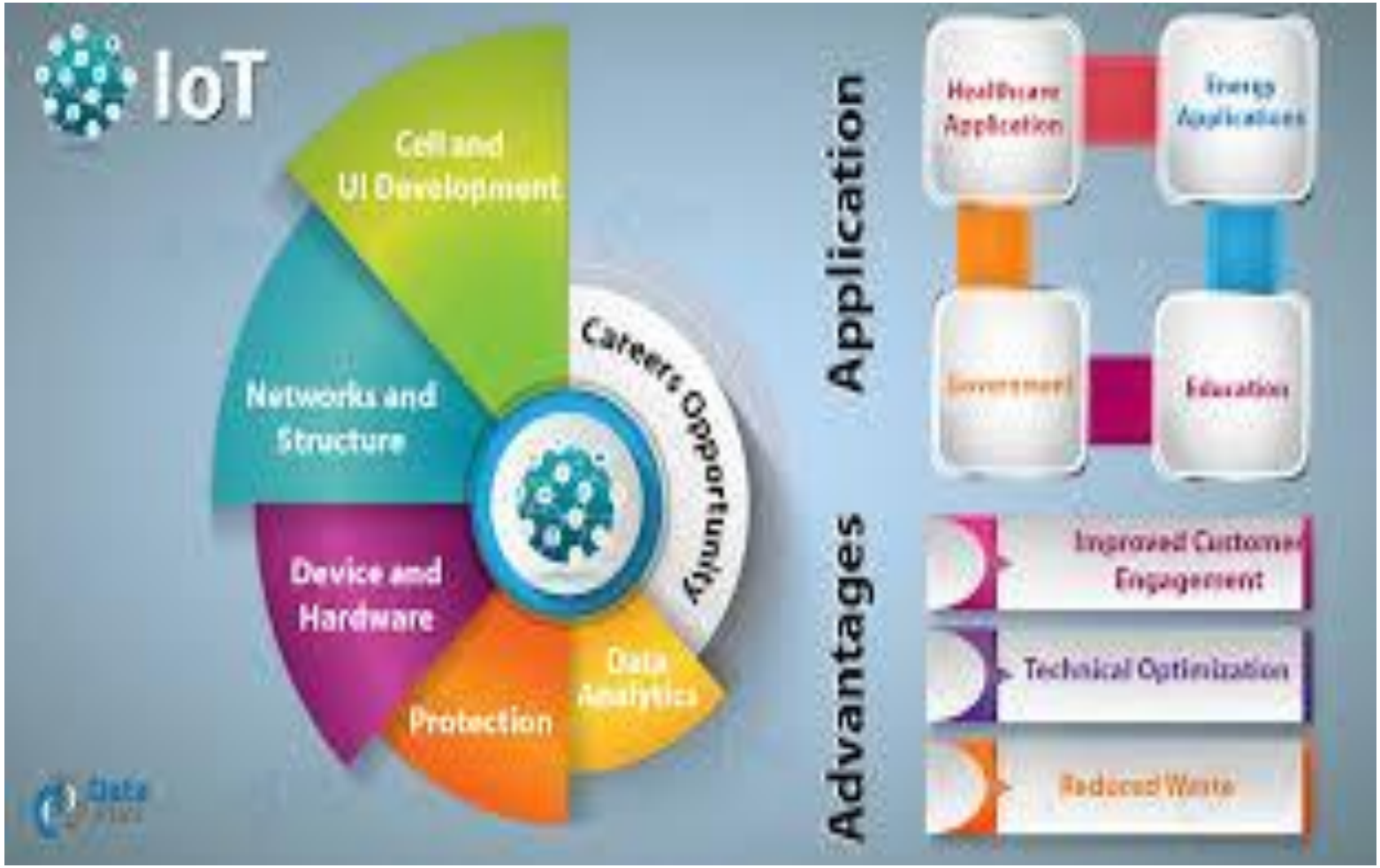
Benefits of IoT



History of IOT



Advantages of IOT



Advantages of IOT

TECHNOLOGICAL CHALLENGES OF IoT

At present IoT is faced with many challenges, such as:

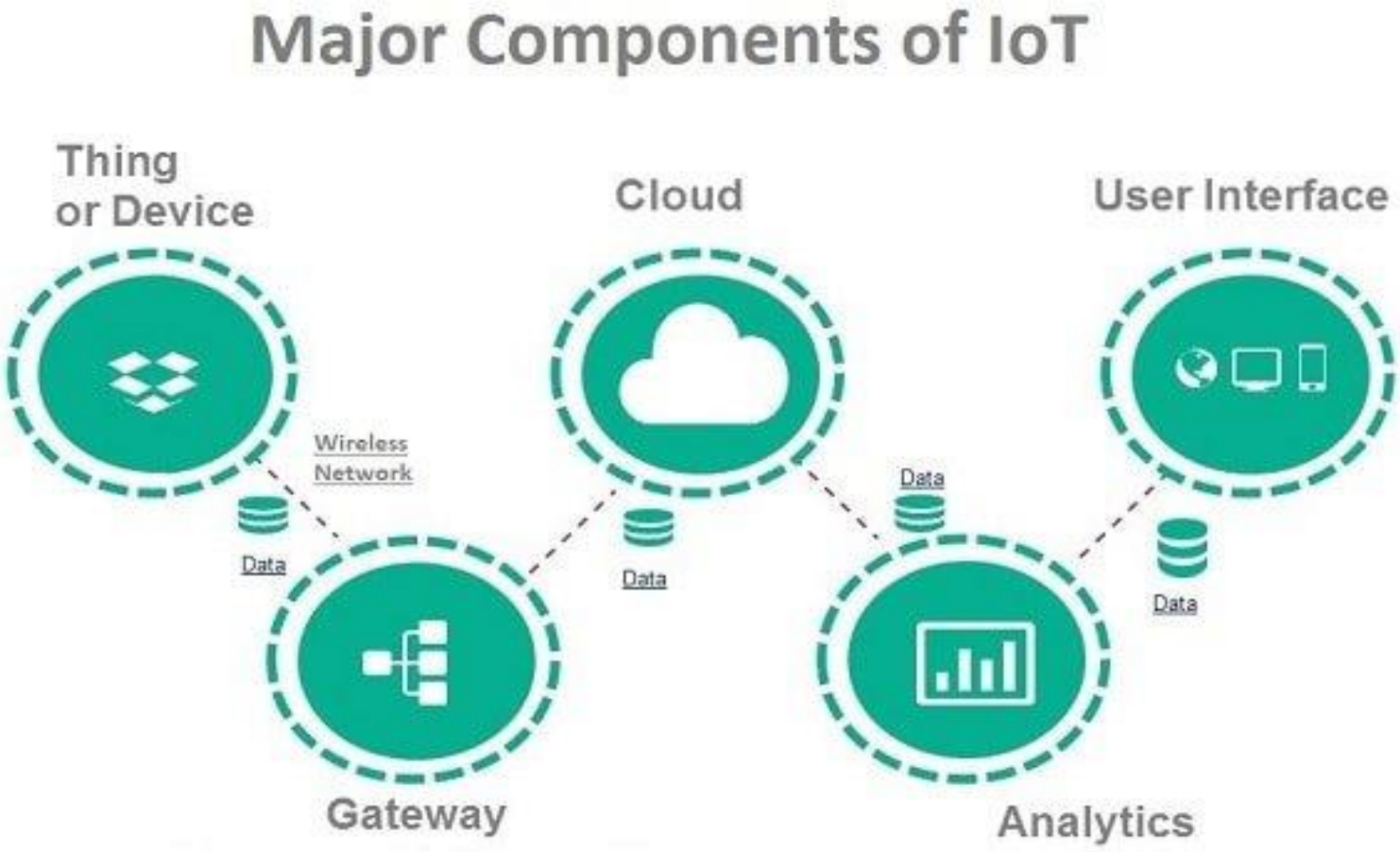
- Scalability
- Technological Standardization
- Inter operability
- Discovery
- Software complexity
- Data volumes and interpretation
- Power Supply
- Interaction and short range communication
- Wireless communication
- Fault tolerance

Challenges of IOT

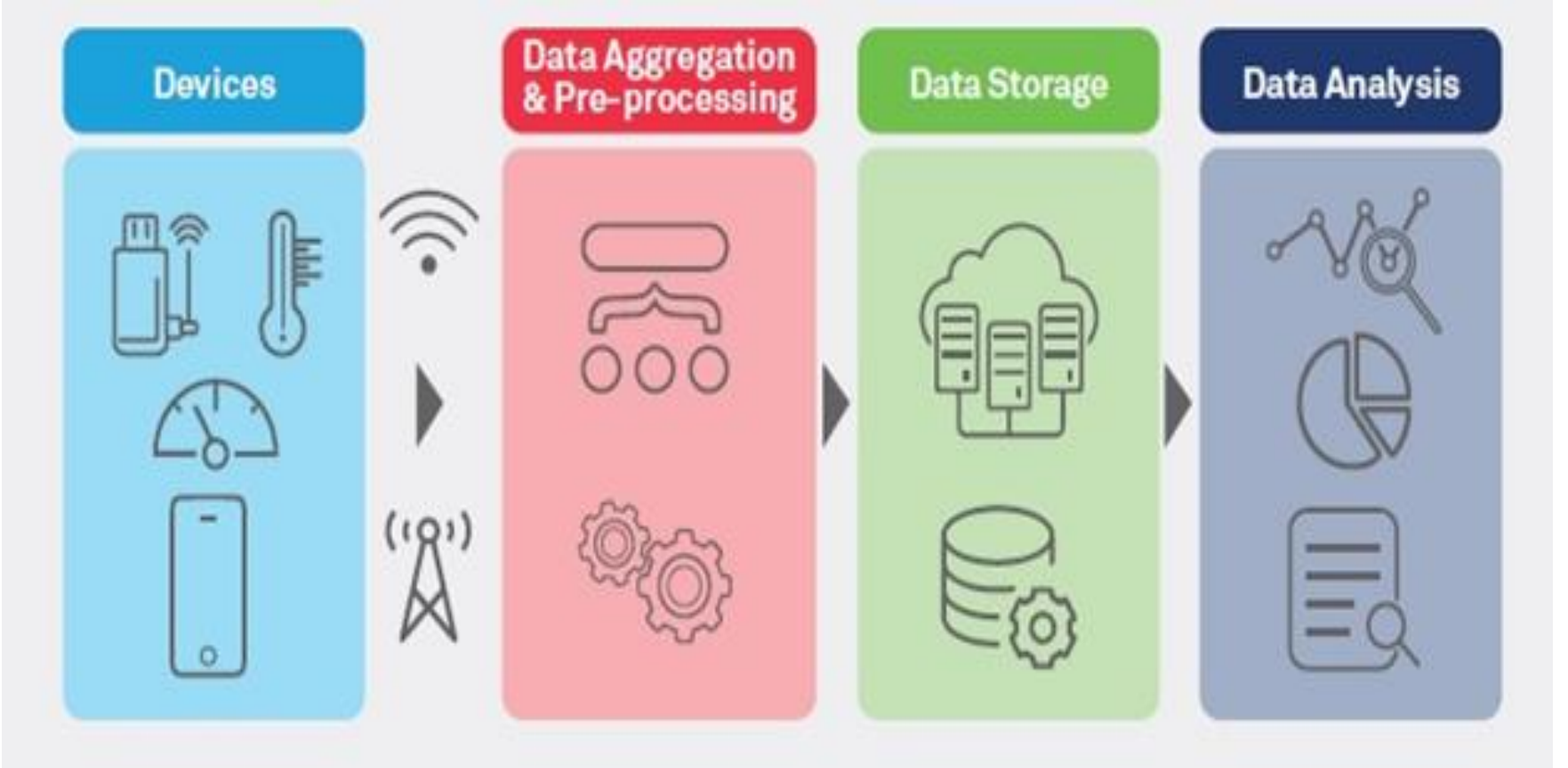
IoT Research Challenges

1. **Naming and Addressing**: Advertising, Searching and Discovery
2. Service Orchestration
3. Power/Energy/Efficient resource management.
   Energy harvesting
4. **Things to Cloud**: Computation and Communication Gateways
5. **Miniaturization**: Sensors, CPU, network
6. **Big Data Analytics**: 35 ZB of data $2B in value by 2020
7. **Semantic technologies**: Information and data models for interoperability
8. **Virtualization**: Multiple sensors aggregated, or a sensor shared by multiple users
9. **Privacy/Security**/Trust/Identity/Anonymity
   Target Pregnancy Prediction
10. Heterogeneity/Dynamics/**Scale**

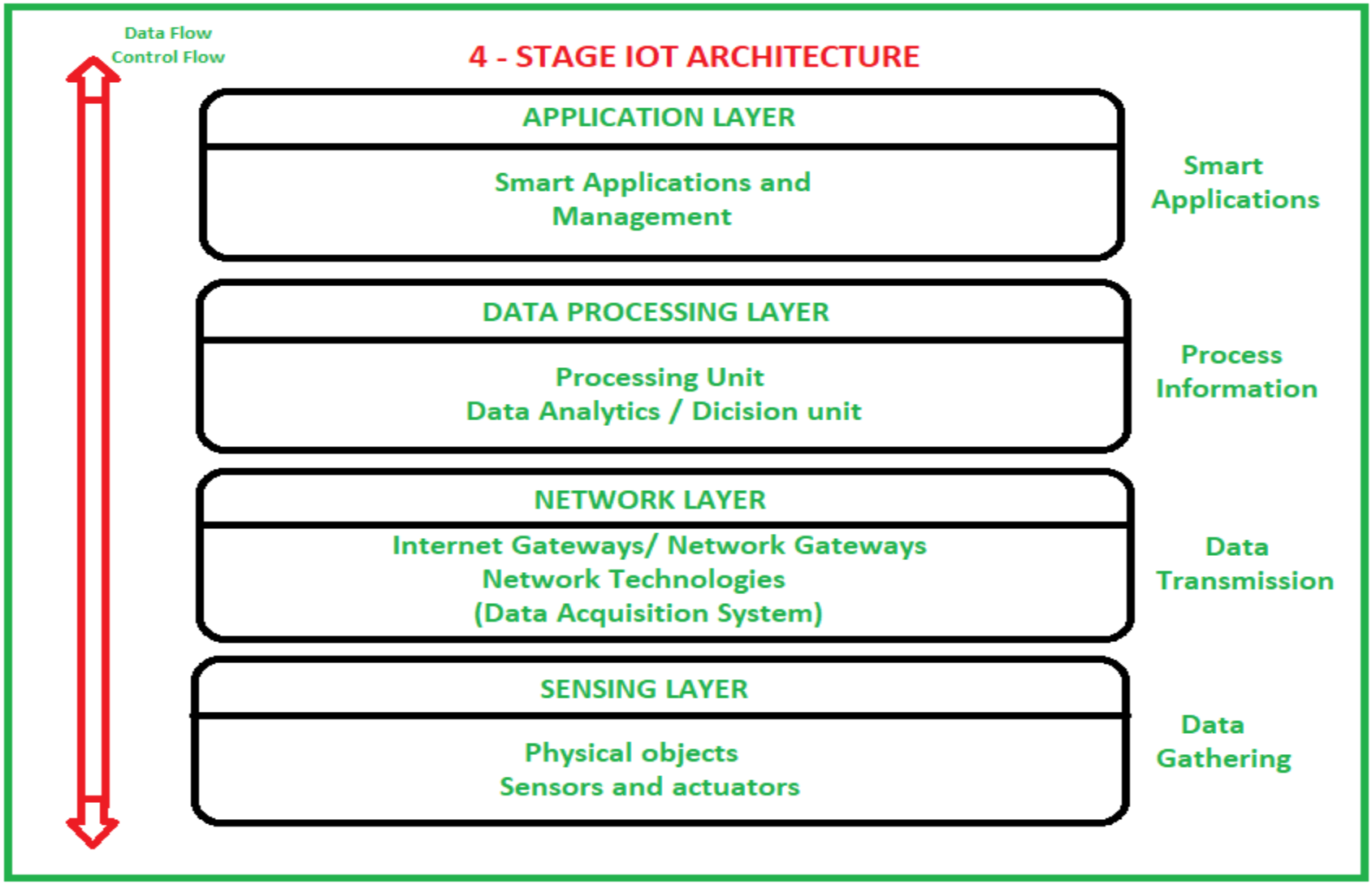
IOT working process

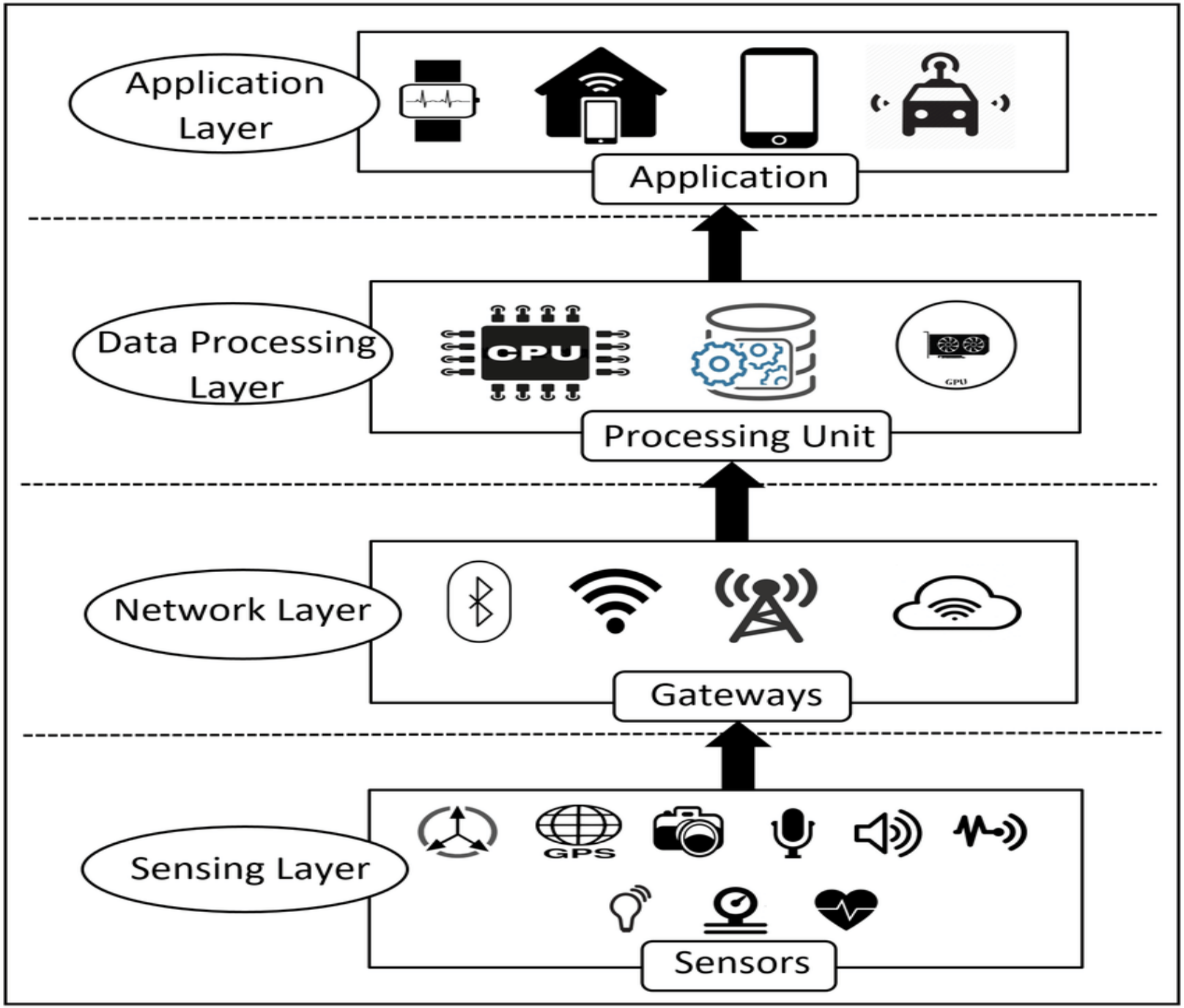


IOT working process

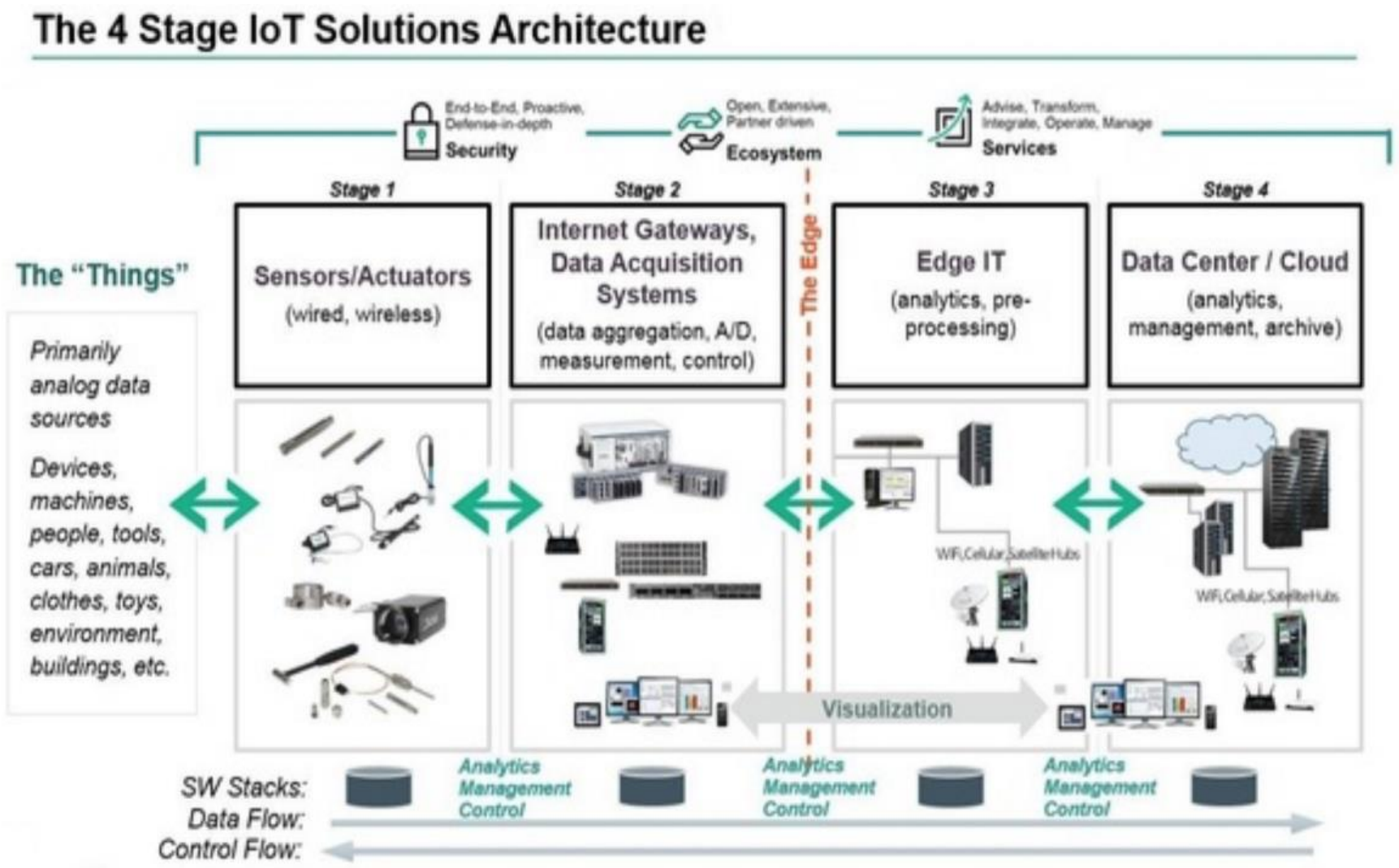


Architecture of IOT




Application Layer
Application
Data Processing Layer
CPU
GPU
Processing Unit
Network Layer
Gateways
Sensing Layer
GPS
Sensors

Architecture of IOT

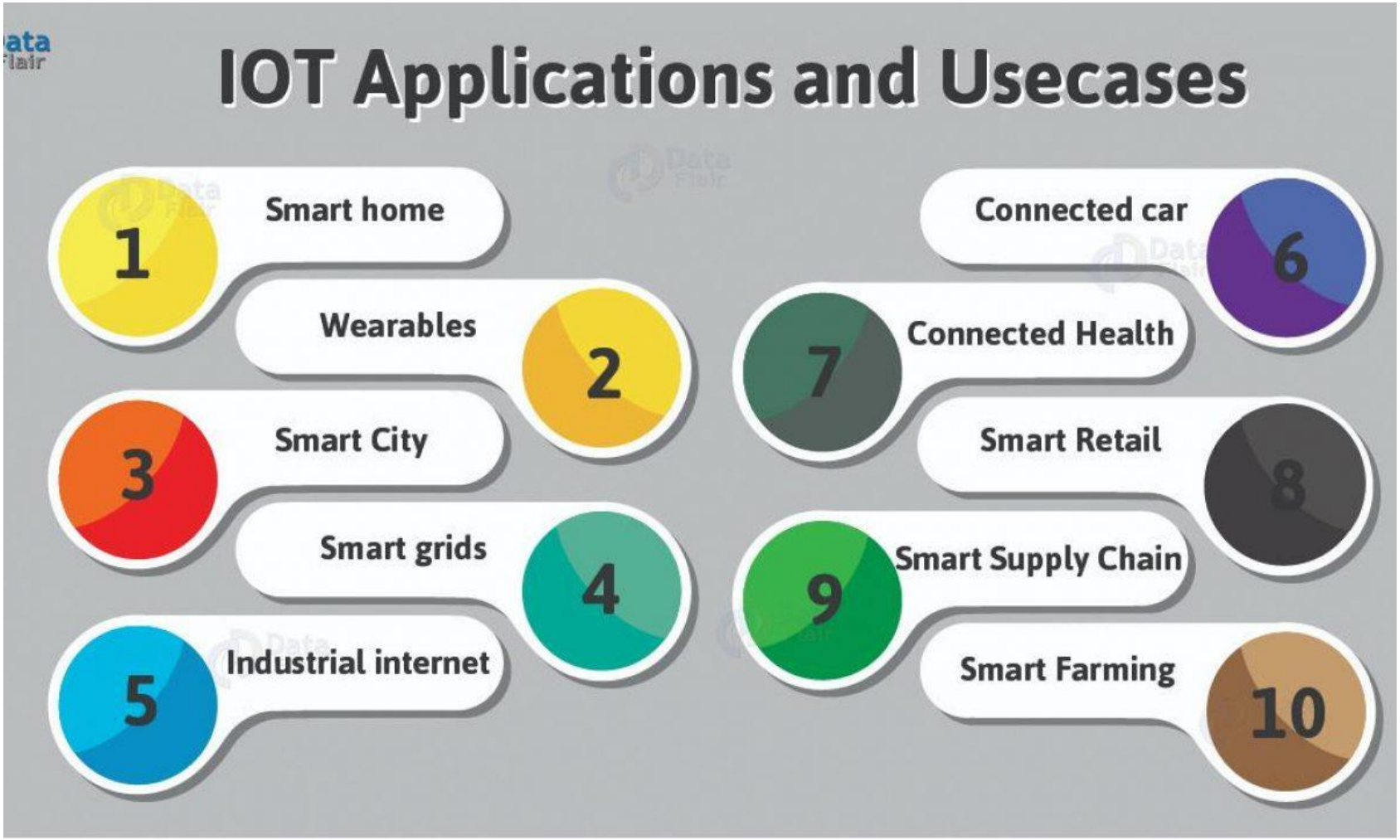


Devices and Network

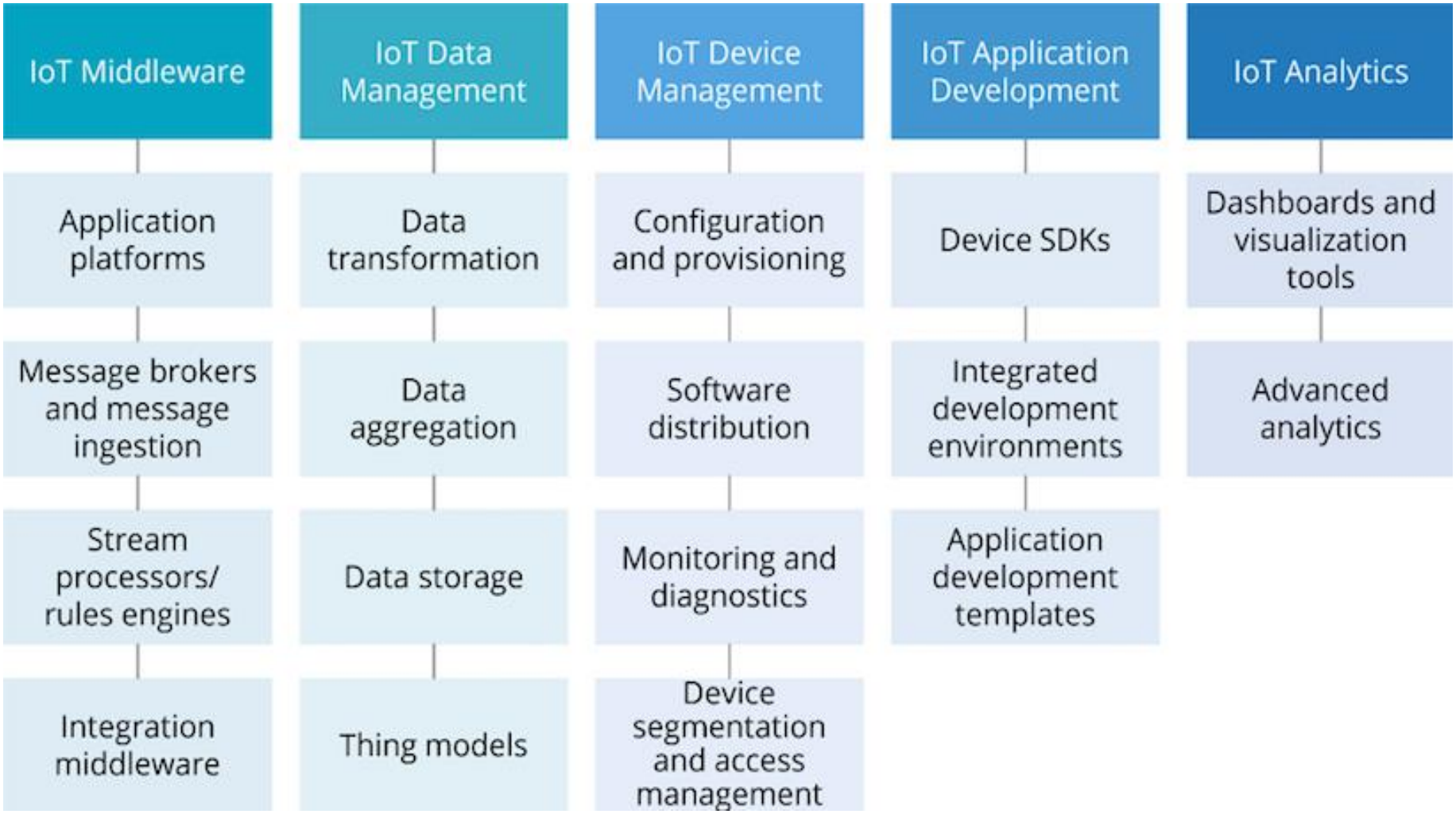

Power Plug
Weather Sensor
Smart Light
Door Sensor
Smoke Detector
Inlet Switch
Smart Gateway
Vibration Sensor
Motion Sensor


Security
Motion Sensor
Door Control
HVAC Control
Lights
Security and Alarm
Light Switch/Dimmer
Thermostat
Energy Management
Internet Gateway
Window Control
Set-Top Box
Home Control Box
Environmental Monitoring
Remote Control

Smart grid; Smart city; Wearable devices; Smart farming



IOT tools and platforms



Sample application

IoT connects a variety of sensors, alarms, cameras, lights, and microphones to provide 24/7/365 security—all of which can be controlled from a smart phone. For example, the **Ring doorbell camera security system** allows users to see, hear, and speak to visitors at their door via a computer, tablet, or mobile phone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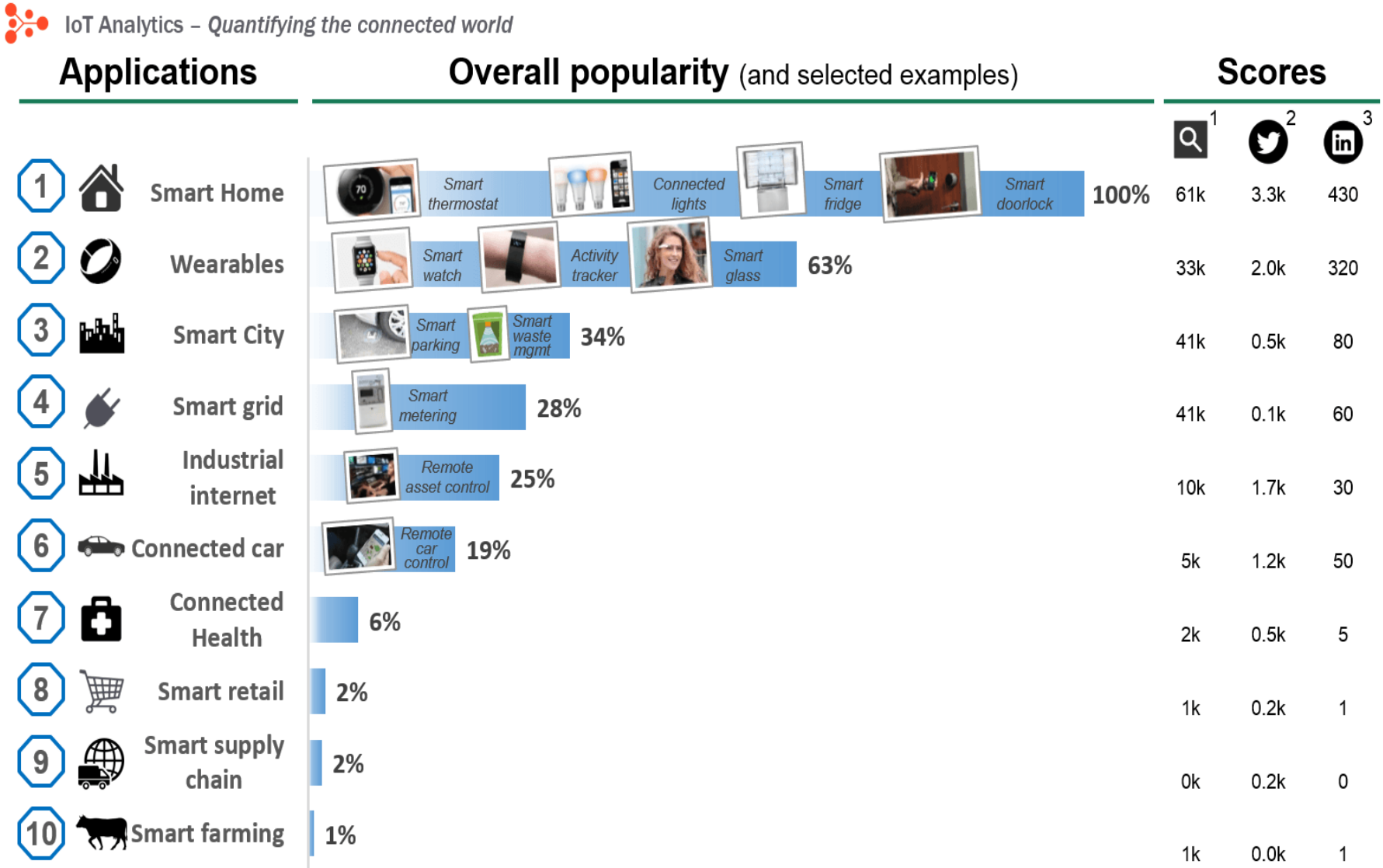
IoT Analytics – *Quantifying the connected world*



1. Monthly worldwide Google searches for the application 2. Monthly Tweets containing the application name and #IOT 3. Monthly LinkedIn Posts that include the application name. All metrics valid for Q4/2014.
Sources: Google, Twitter, LinkedIn, IoT Analytics

Consumer & Home

Smart Infrastructure

Security & Surveillance

Healthcare

Network

Transportation

Retail

Industrial

Others

IoT applications run **on IoT devices** and can be created to be specific to almost every industry and vertical, including healthcare, industrial automation, smart homes and buildings, automotive, and wearable technology. Increasingly, IoT applications are using AI and machine learning to add intelligence to devices.

- LPWANs. Low Power Wide Area Networks (LPWANs) are the new phenomenon in IoT. ...
- Cellular (3G/4G/5G) ...
- Zigbee and Other Mesh Protocols. ...
- Bluetooth and BLE. ...
- Wi-Fi. ...
- RFID.

Components of IoT

Communication layer includes both physical connectivity solutions (cellular, satellite, LAN) and specific protocols used in varying IoT environments **(ZigBee, Thread, Z-Wave, MQTT, LwM2M)**. Choosing the relevant communications solution is one of the vital parts in constructing every IoT technology stack

Is IoT a new Technology?

The IoT, along with artificial intelligence, machine learning and cloud technology, has been one of the most important trends in high-tech over the past couple years. It has been developing at astonishing speeds since its inception, often rapidly changing direction and popping up in new and quite unexpected forms

Sl No	Title of the book	Name of the Author/s	Publisher Name	Edition and year
1	Designing for Emerging Technologies: UX for Genomics, Robotics, and the Internet of Things	Follett, J.	O'Reilly Media	2014
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Emerging Exponential Technologies

20MBA301

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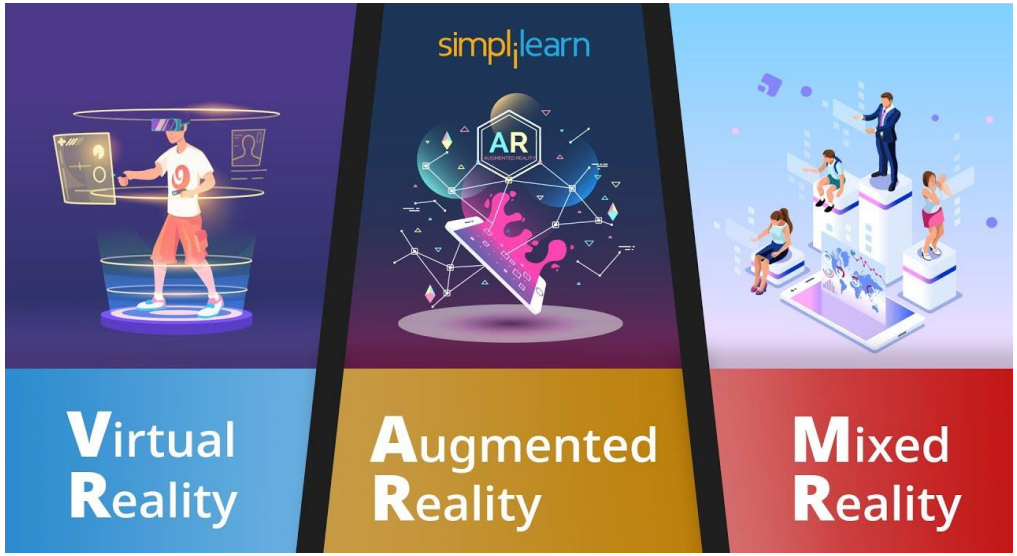
Unit-5

Augmented Reality (AR) and Virtual Reality (VR)

- Introduction to AR, Virtual reality (VR), Augmented Reality (AR) vs mixed reality (MR), Architecture of AR systems. Application of AR systems (education, medical, assistance, entertainment) workshop oriented hands demo.

Augmented Reality (AR) and Virtual Reality (VR)



Introduction to AR

- The distinctions between VR and AR come down to the devices they require and the experience itself: **AR uses a real-world setting** while VR is completely virtual. ... VR requires a headset device, but AR can be accessed with a smartphone. AR enhances both the virtual and real world while VR only enhances a fictional reality.

Augmented Reality (AR)

- Augmented reality (AR) is an **interactive experience of a real-world environment** where the objects that reside in the real world are enhanced by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory and olfactory.
- Augmented reality (AR) involves **overlaying visual, auditory, or other sensory information onto the world in order to enhance one's experience**. Retailers and other companies can use augmented reality to promote products or services, launch novel marketing campaigns, and collect unique user data.

- Augmented Reality Apps are software applications which merge the digital visual (audio and other types also) content into the user's real-world environment. ... Some other popular examples of AR apps include **AcrossAir, Google Sky Map, Layar, Lookator, SpotCrime, PokemonGo** etc.

- There are various uses of AR software like training, work and consumer applications in various industries including public safety, healthcare, tourism, gas and oil, and marketing.

- The first commercial application of AR technology was the yellow “first down” line that began appearing in televised football games in 1998. Some other popular examples of AR apps include AcrossAir, Google Sky Map, Layar, Lookator, SpotCrime, PokemonGo etc. We have collected 8 examples of augmented reality apps and how they can impact the future of mobile technology.

Categories of AR Apps and Examples of their Usage:

- **a) Augmented Reality in 3D viewers:**
- This allows users to put life-size 3D models in their environment with or without the use of trackers. Trackers are the simple images that 3D models can be linked to in Augmented Reality.
- *Examples: AUGMENT, Sun Seeker, etc.*

Sun-Seeker:

Sun-Seeker is an AR app which provides a flat compass view and a 3D view showing the solar path, its hour intervals, its equinox, winter and summer solstice paths, sunrise and sunset times, twilight times, magic hours and also a Map view showing solar direction for each daylight hour. The app runs on both the mediums i.e., Android and iOS. The app has got 3+ ratings from its users.

- Photographers – For planning ideal light conditions, sunrise or sunset directions, golden and blue hour times
- Cinematographers – To search for the exact exposure of Sun, directions and times for any location.
- **Real Estate** Buyers – To search for the sun exposure properties that the customers are considering
- Drivers – To find how long the car will remain in the shade at any parking spot
- Campers – To find where to camp, sit or pitch an umbrella
- Gardeners – Helps to search for ideal locations for planting and seasonal sunlight hours
- Architects – For visualizing the spatial variability of the solar angle throughout the year.

ARGON4:

- This is a fully-featured web browser that has the ability to display augmented reality content created with the argon. js Javascript framework.
- argon.js makes it easier for adding augmented reality content to the web applications in a platform and technology-independent way and supports the real-time AR capabilities of the Argon4 Browser. The Argon4 browser is available on both iTunes App Store and Google Play Store.

AR Browser SDK:

- This is a browser created by ARLab. This browser allows the users to add augmented reality geolocation view to the Android and or iOS application in less than 5 minutes. With user-friendly API (Application Programming Interface), it can be fully customized. The framework takes care of all the complex functions of the augmented reality browser.

- It provides video support.
- It adds and removes single POIs in real time.
- It can run on any device.
- It offers great performance and memory management.
- It has an exceptionally light view, smooth and accurate movements.
- It provides custom activities like SMS, call, email, video, social networks and more.

Augmented Reality Games:

- AR Gaming software is probably the most common type of App. These apps create mesmeric gaming experiences that use your actual surroundings.
- *Examples: Pokémon Go, Parallel Kingdom, Temple Treasure Hunt, Real Strike, Zombie Go, etc.*

REAL STRIKE:

- This is a popular shooting AR game which is available only on iOS. The users get a real life shooting experience in this game and can record their fights and also create their own videos.
- There is a pool which has been polluted by nuclear waste and a group of pests is just around the corner so players have to stop them infecting the earth.
- Users use their phone to scan the mark. The game offers night and thermal vision goggles to get a clear view even in the evening to complete your mission.

Augmented Reality GPS:

- AR applications in smartphones generally include Global Positioning System (GPS) to spot the user's location and its compass to detect device orientation.
- *Examples: AR GPS Compass Map 3D, AR GPS Drive/Walk Navigation, etc.*

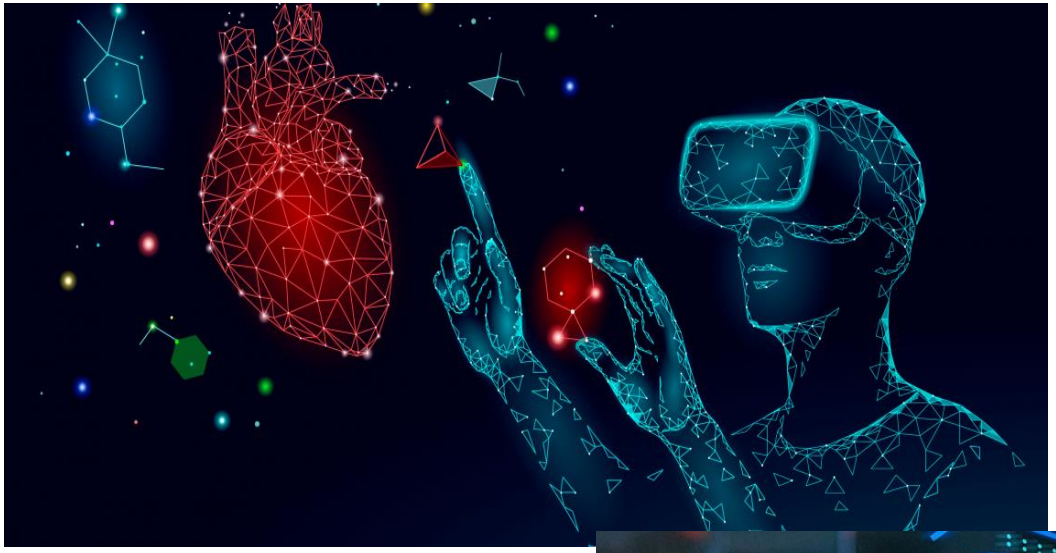
AR GPS Drive/Walk Navigation:

- The application makes use of the smart phone's GPS and camera to execute a car navigation system with an augmented reality-powered technology. It is easier and safer than the normal navigation system for the driver. This application is available only on Android.

- This app guides the drivers directly by the virtual path of the camera preview video which makes it easy for them to understand. The drivers do not need to map the map the path and the road while using this app. The driver can see the real-time camera preview navigation screen to get driving condition without hindering his safety.

- Apart from AR, **Virtual Reality** is also gaining significant traction in the mobile industry.

- AR apps act as a magic window for the viewers that lets them see the holograms and manipulate 3D models.



Virtual Reality (VR)

- Virtual Reality (VR) is **a computer-generated environment with scenes and objects that appear to be real**, making the user feel they are immersed in their surroundings. This environment is perceived through a device known as a Virtual Reality headset or helmet.

- Virtual reality or VR is a technology that creates a virtual environment. People interact in those environments using, for example, **VR goggles** or other mobile devices. It is a computer-generated simulation of an environment or 3-dimensional image where people can interact in a seemingly real or physical way.

- **Games, surgery and flight simulators** are the most well known uses of virtual reality but other, lesser well known applications include: Visualisations, e.g. geographical. Study and treatment of addictions. Weather forecasting.
-

- Virtual reality can be used by coaches and players **to train more efficiently across a range of sports**, as they are able to watch and experience certain situations repeatedly and can improve each time. Essentially, it's used as a training aid to help measure athletic performance and analyze technique.

- There are a wide variety of applications for virtual reality which include:
- Architecture
- Sport
- Medicine
- The Arts
- Entertainment

Types of VR

- The only limits to a VR experience are the availability of content and computing power. There are 3 primary categories of virtual reality simulations used today: **non-immersive, semi-immersive, and fully-immersive simulations**.

Augmented Reality (AR) vs mixed reality (MR)

Augmented reality (AR) adds digital elements to a live view often by using the camera on a smartphone. ... In a Mixed Reality (MR) experience, which **combines elements of both AR and VR, real-**world and digital objects interact.

Mixed Reality (MR)

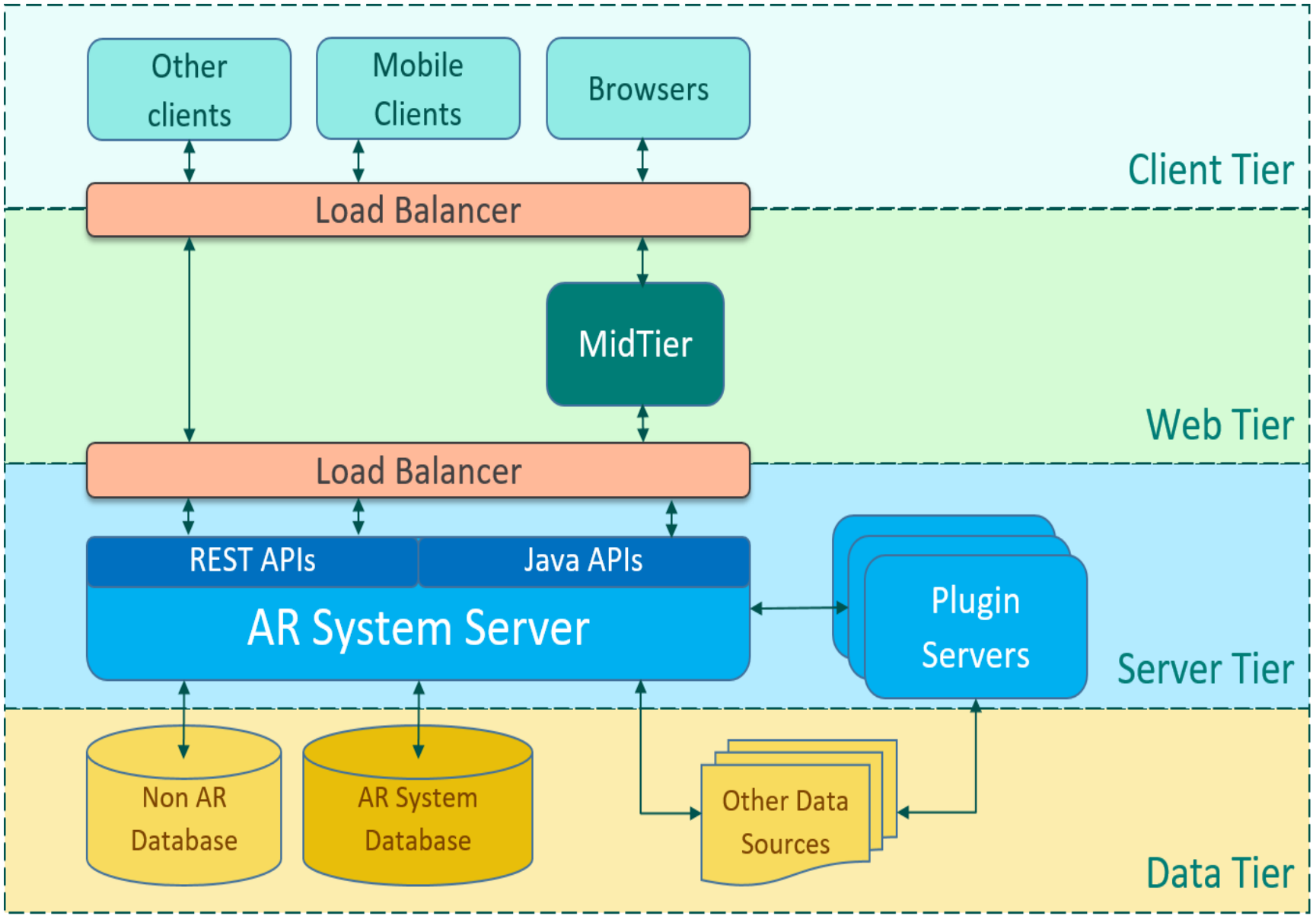
- In a Mixed Reality (MR) experience, which combines elements of both AR and VR, real-world and digital objects interact. Mixed reality technology is just now starting to take off with Microsoft's HoloLens one of the most notable early mixed reality apparatuses.

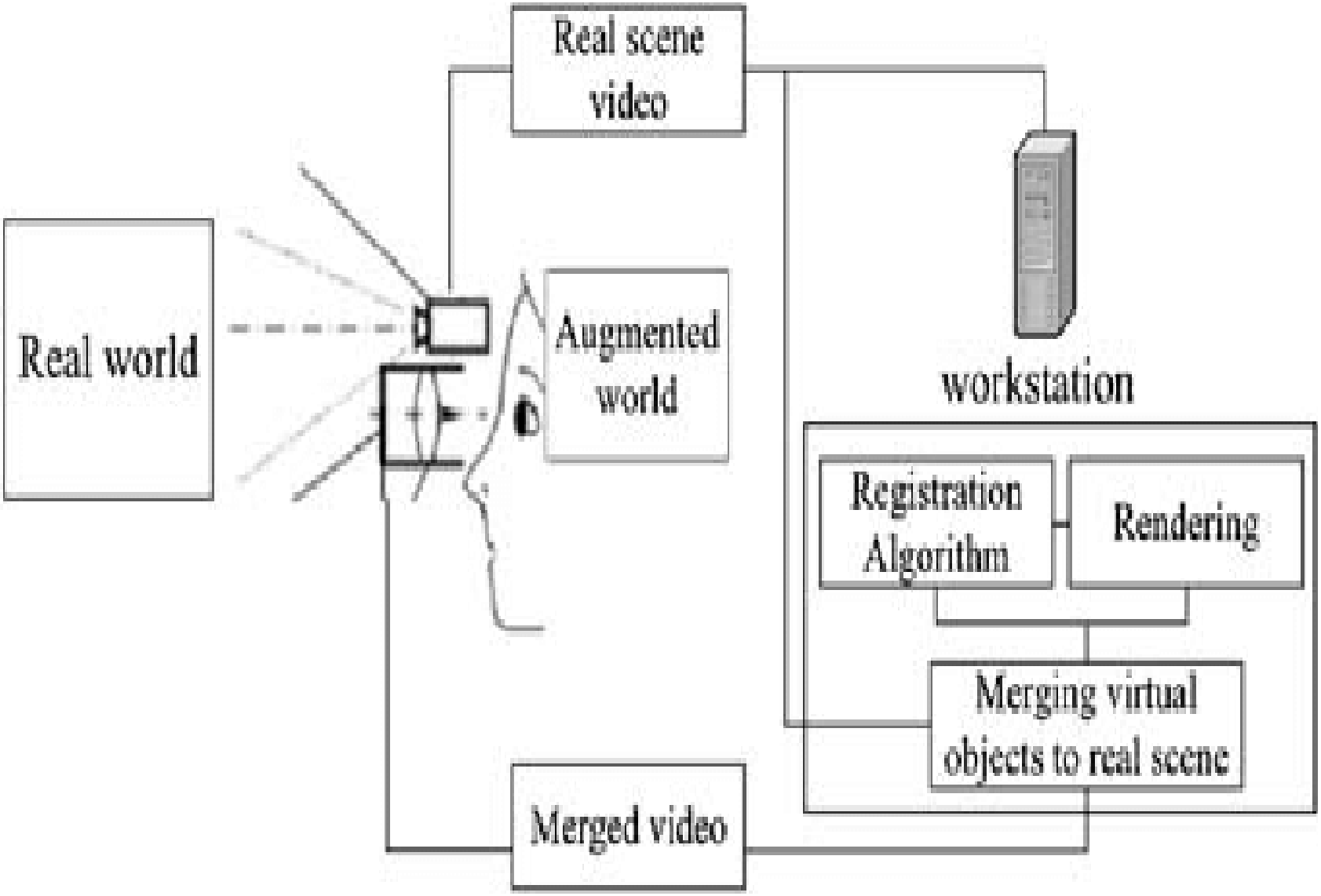
- **Using Virtual Reality Technologies** From gaming, to movies, to medicine, the uses for Virtual Reality, Augmented Reality, and Mixed Reality are expanding.
- **Healthcare**—For training, such as for surgical simulations
- **Film and TV**—For movies and shows to create unique experiences
- **Virtual travel**—For virtual trips to an art museum—or another planet—all from home
- **Professional sports**—For training programs like STRIVR to help pro and amateur athletes
- **Gaming**—For over 1,000 games already available, from first-person shooters to strategy games to role-playing adventures

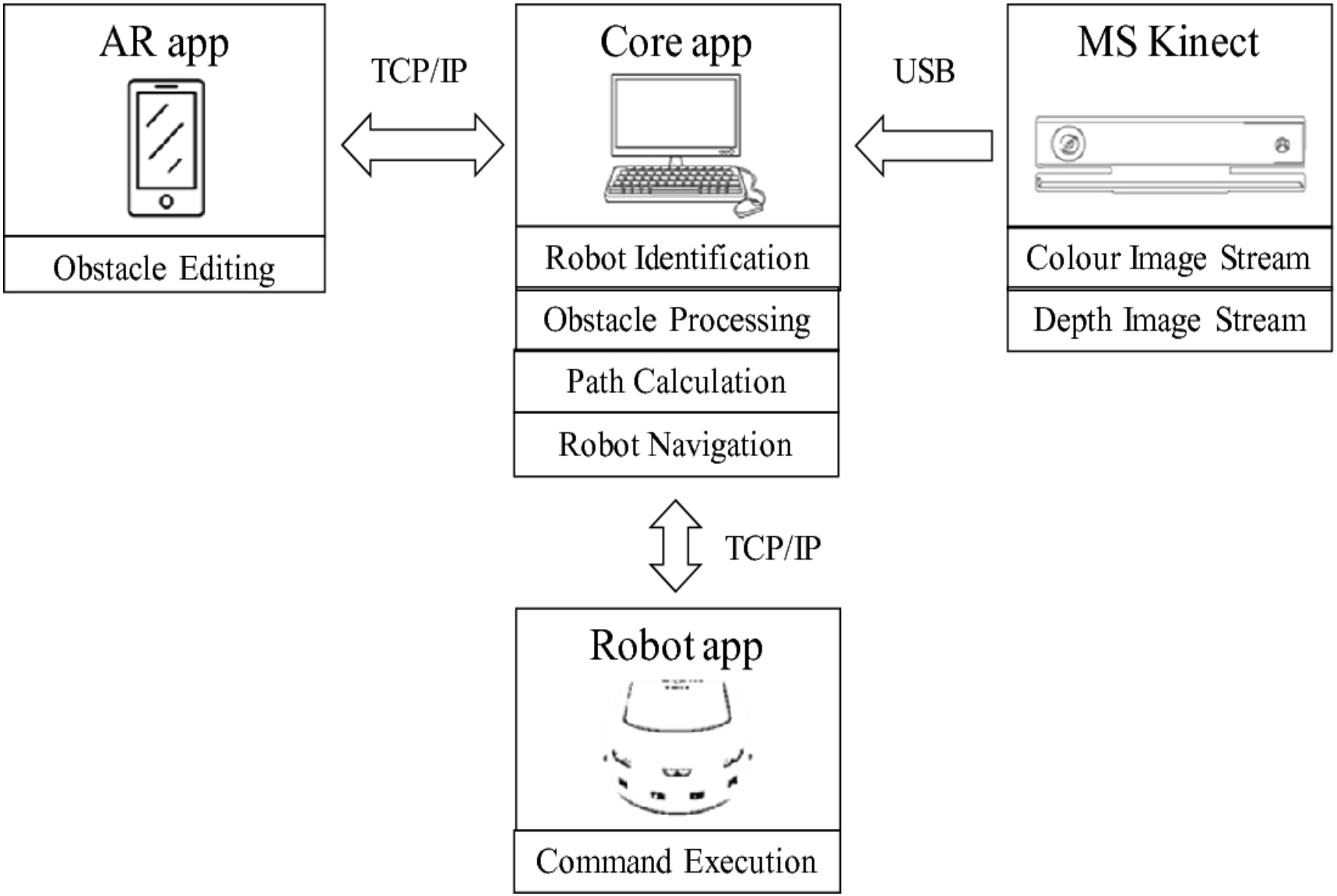
Augmented Reality (AR) can provide architects with **the ability to digitally interact with their projects past the computer screen by merging a digital model over a physical space**. AR creates a 3D version of the proposed model and places it over the physical reality in the project's real environment.

Architecture of AR systems

- There are many applications in the manufacturing sector waiting to be explored by augmented reality. These include **predictive maintenance, streamlined logistics, more efficient product design and development, optimized assembly schedule and processes, and expert support with data management**.


Other clients
Mobile Clients
Browsers
Client Tier
Load Balancer
MidTier
Web Tier
Load Balancer
REST APIs
Java APIs
AR System Server
Plugin Servers
Server Tier
Non AR Database
AR System Database
Other Data Sources
Data Tier


Real scene video
Real world
Augmented world
workstation
Registration Algorithm
Rendering
Merging virtual objects to real scene
Merged video


AR app
Obstacle Editing
TCP/IP
Core app
Robot Identification
Obstacle Processing
Path Calculation
Robot Navigation
USB
MS Kinect
Colour Image Stream
Depth Image Stream
TCP/IP
Robot app
Command Execution

Augmented reality (AR) is an **interactive experience of a real-world environment** where the objects that reside in the real world are enhanced by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory and olfactory.

workshop oriented hands demo

- https://www.youtube.com/watch?v=oH_LfXnklRw
- https://www.youtube.com/watch?v=NOKJDCqvvMk

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Technology and Ethics


teamwork
attitude
ethics
honesty
CORE
VALUES
reliable
respect
integrity


ETHICS
ACCOUNTABILITY
PRINCIPLES
INTEGRITY
VALUES

- Technology ethics is **the application of ethical thinking to the practical concerns of technology**. The reason technology ethics is growing in prominence is that new technologies give us more power to act, which means that we have to make choices we didn't have to make before.

- Types of Technology Ethics. Technology ethics are principles that can be used to govern technology including factors like risk management and individual rights. They are basically used to **understand and resolve moral issues** that have to do with the development and application of technology of different types.

- Businesses are faced with many ethical challenges, particularly when it comes to the use of technology. ... Ethical issues such as **how we treat others, use information, engage with employees, manage resources, approach sustainability, and impact the world around us** all affect how we view companies.

The following are common areas of technology ethics.

- Access Rights. Access to empowering technology as a right or freedom.
- Accountability. The rules of accountability for decisions made by technology.
- Digital Rights. ...
- Environment. ...
- Existential Risk. ...
- Freedom. ...
- Health & Safety. ...
- Human Enhancement.

Ethics in information technology is important because it **creates a culture of trust, responsibility, integrity and excellence in the use of resources**. Ethics also promotes privacy, confidentiality of information and unauthorized access to computer networks, helping to prevent conflict and dishonesty.

- One of the most immediate reasons why digital ethics are important is because **how we present, indeed construct our persona(s) effects the way in which our communication and intentions will be received**. The notion that individual ethics impact our arguments is nothing new.

There are many types of technology ethics:

- Access rights: access to empowering technology as a right·
- Accountability: decisions made for who is responsible when considering success or harm in technological advancements·
- Digital Rights: protecting intellectual property rights and privacy rights·
- Environment: how to produce technology that could harm the environment·
- Existential Risk: technologies that represent a threat to the global quality of life pertaining to extinction·
- Freedom: technology that is used to control a society raising questions related to freedom and independence·

- Health & Safety: health and safety risks that are increased and imposed by technologies
- Human Enhancement: human genetic engineering and human-machine integration
- Human Judgment: when can decisions be judged by automation and when do they acquire a reasonable human?
- Over-Automation: when does automation decrease quality of life and start affecting society?

- Precaution Principle: Who decides that developing this new technology is safe for the world?
- Privacy: protection of privacy rights
- Security: Is due diligence required to ensure information security?
- Self Replicating Technology: should self replicating be the norm?
- Technology Transparency: clearly explaining how a technology works and what its intentions are
- Terms of Service: ethics related to legal agreements.

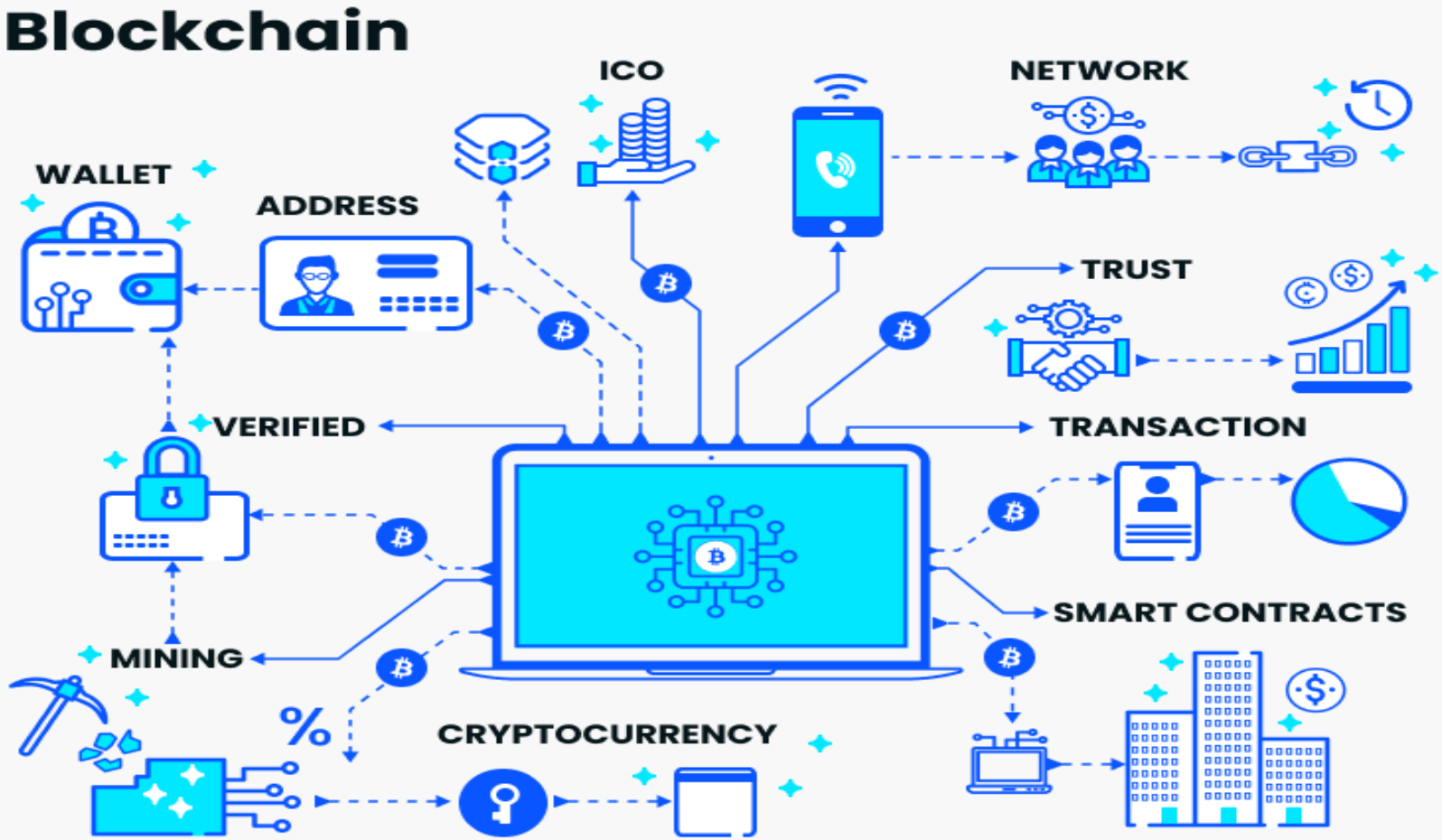
Current issues

- Copyrights
- Cybercriminality
- Privacy vs Security: Full Body airport scanners
- Privacy and GPS technologies
- Genetically Modified Organisms
- Pregnancy Screening Technology
- Technology and Ethics in the Music Industry
- User Data
- Drones
- Pet cloning

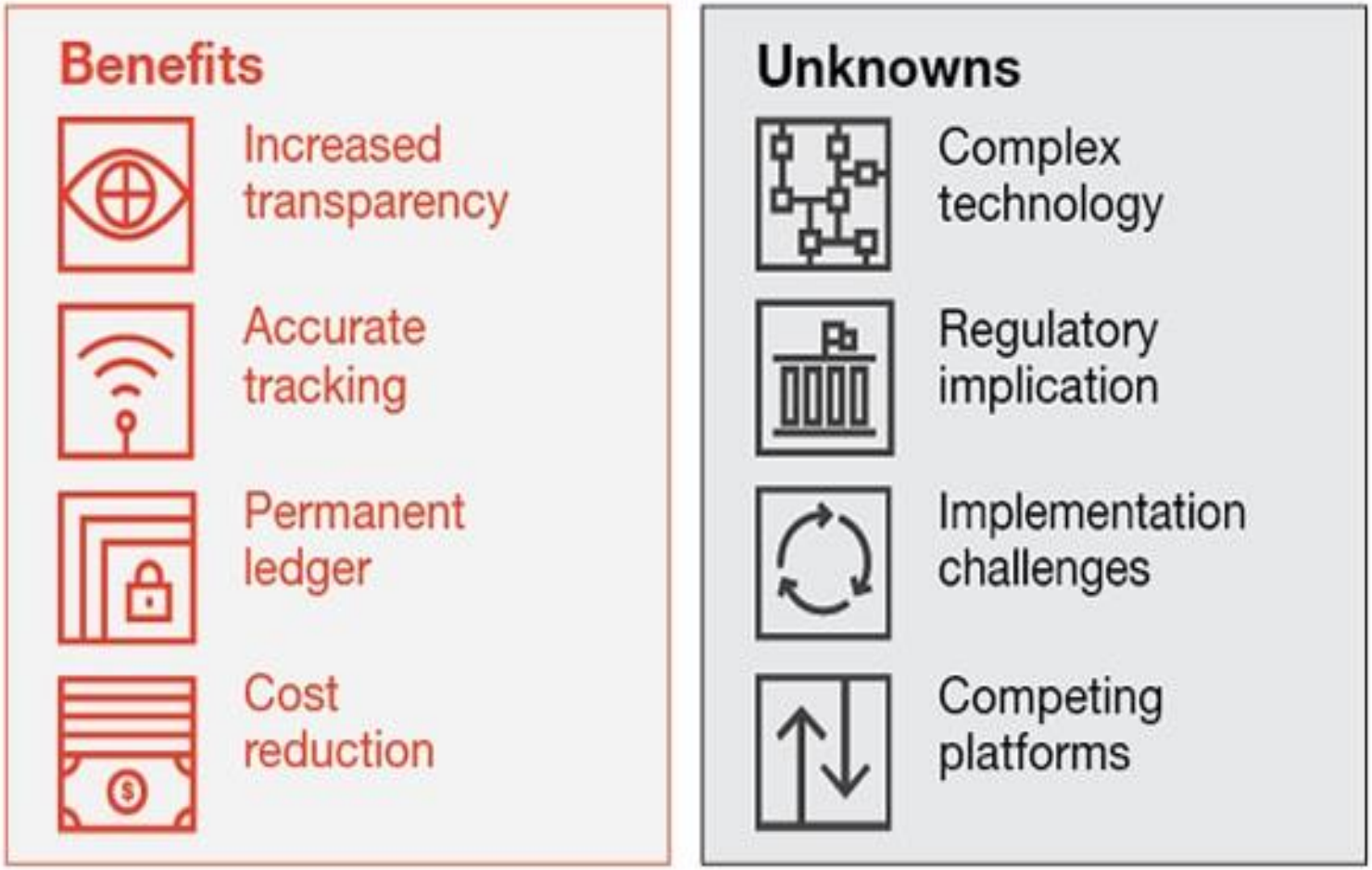
Information and communications technologies (ICTs)

- organizations have seen an increase in the amount of technology that they rely on to communicate within and outside of the workplace. However, these implementations of technology in the workplace create various ethical concerns and in turn a need for further analysis of technology in organizations. As a result of this growing trend, a subsection of techno ethics known as organizational techno ethics has emerged to address these issues.

Other Technologies:



Blockchain's benefits and unknowns



- Blockchain is a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network. An asset can be tangible (a house, car, cash, land) or intangible (intellectual property, patents, copyrights, branding). Virtually anything of value can be tracked and traded on a blockchain network, reducing risk and cutting costs for all involved.

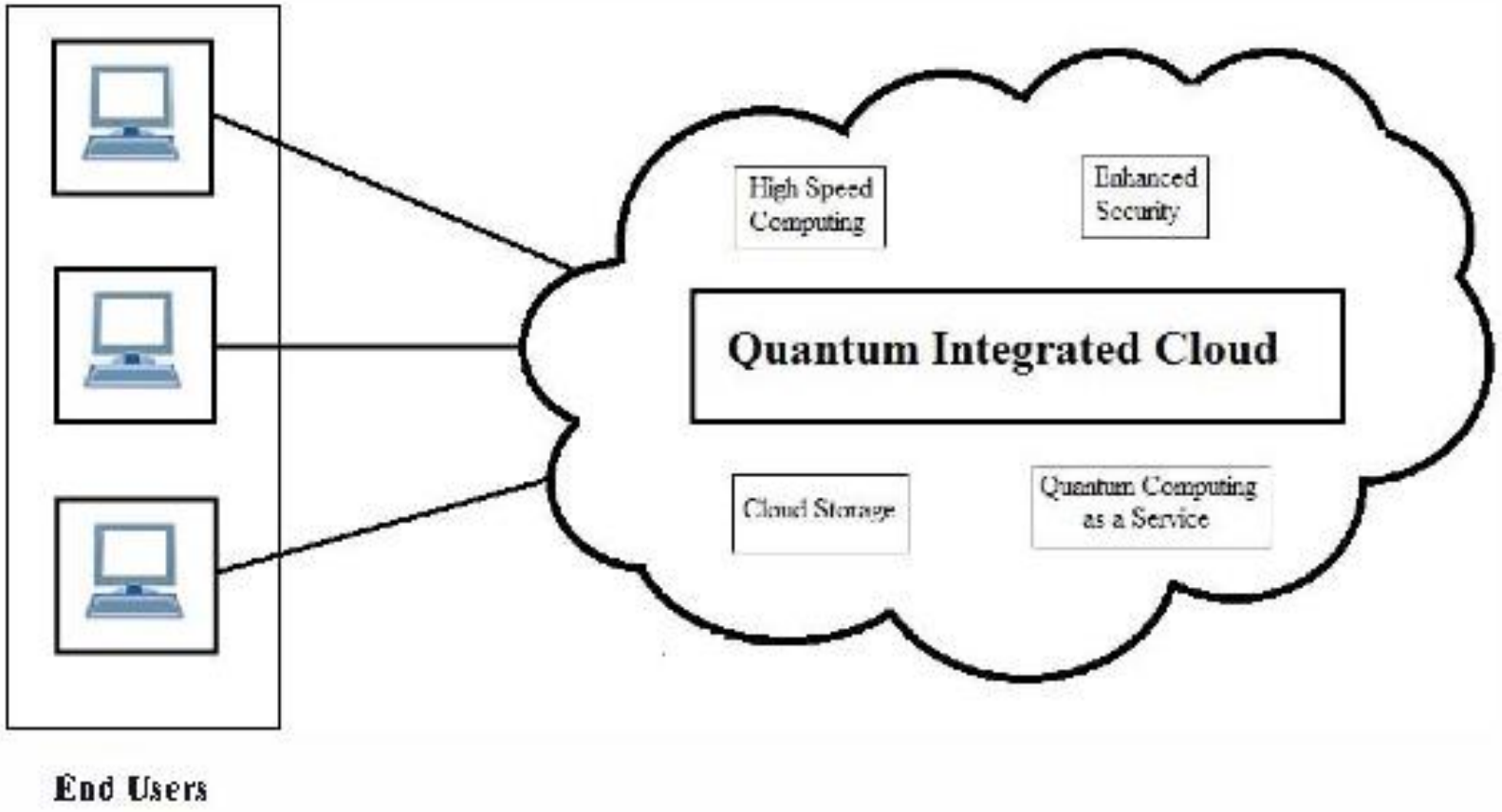
Why blockchain is important:

- Business runs on information. The faster it's received and the more accurate it is, the better. Blockchain is ideal for delivering that information because it provides immediate, shared and completely transparent information stored on an immutable ledger that can be accessed only by permissioned network members.
- A blockchain network can track orders, payments, accounts, production and much more. And because members share a single view of the truth, you can see all details of a transaction end-to-end, giving you greater confidence, as well as new efficiencies and opportunities.

- Blockchain is **a system of recording information in a way** that makes it difficult or impossible to change, hack, or cheat the system. A blockchain is essentially a digital ledger of transactions that is duplicated and distributed across the entire network of computer systems on the blockchain.

- The original **Blockchain** is open-source technology which offers an alternative to the traditional intermediary for transfers of the crypto-currency **Bitcoin**. The intermediary is replaced by the **collective verification of the ecosystem** offering a huge degree of traceability, security and speed.

Cloud and quantum computing



Quantum Computing Use Cases

Cryptography

▪Quantum computers are famous for code-breaking, but their real power may lie in making cloud computing more secure. Based on laws of physics, quantum computers have the potential to keep private data safe from snoops and hackers, no matter where it is stored or processed.

Medicine & Materials

▪A quantum computer mimics the computing style of nature, allowing it to simulate, understand and improve upon natural things—like molecules, and their interactions and compounds-better than a classical computer. This ability could lead to new medical advances and materials discovery.

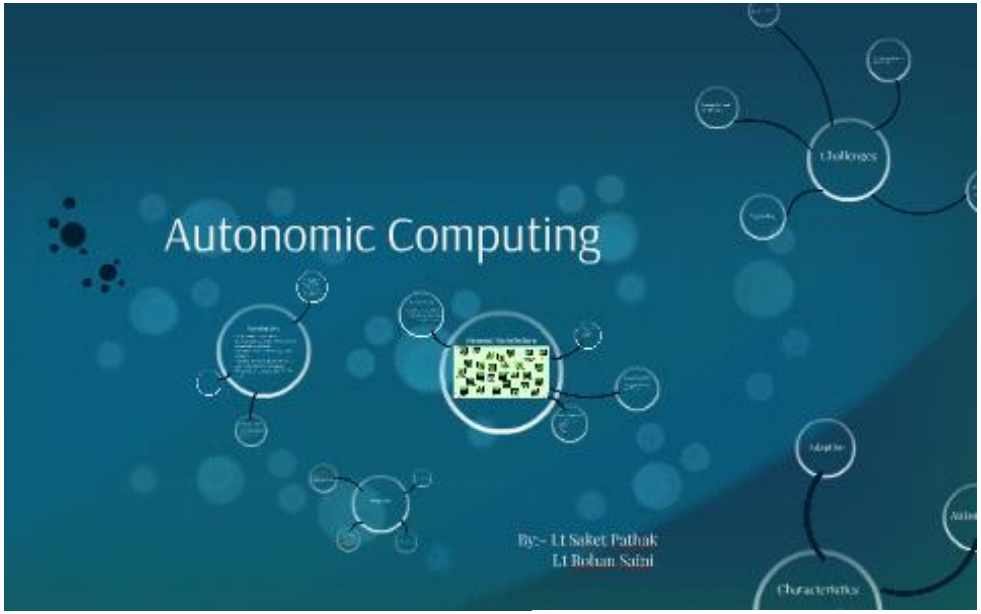
Machine Learning

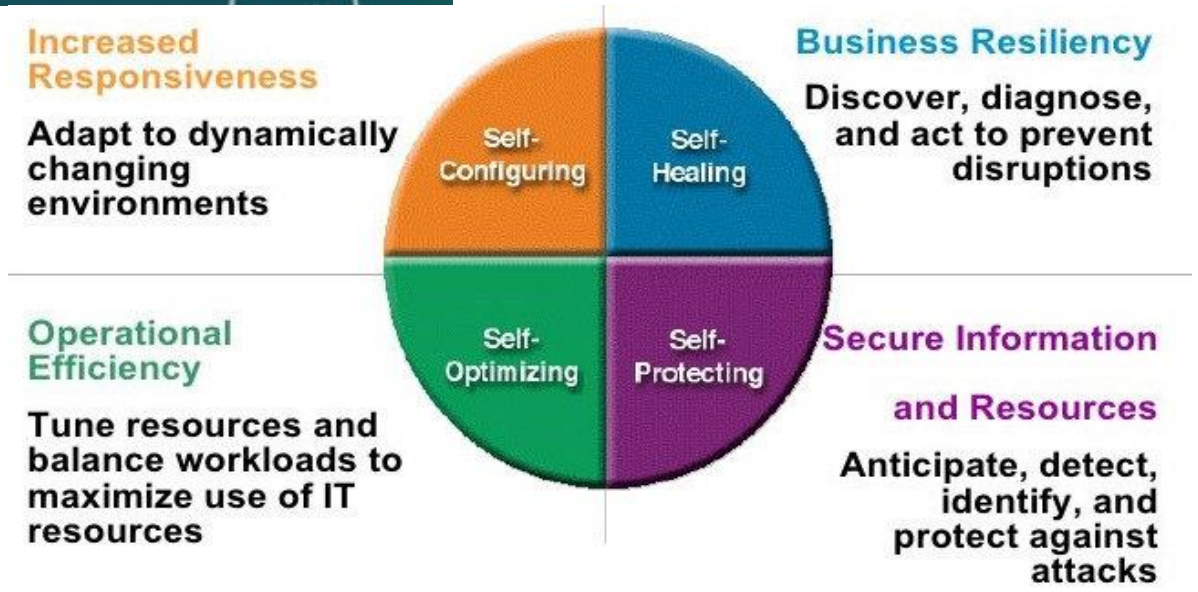
▪Quantum machine learning is an exciting and new area. Research indicates that quantum computing could significantly accelerate machine learning and data analysis tasks, such as training of classical Boltzmann machines, or topological analysis of big data. .

Searching Big Data

▪A machine that can search the ever-growing amount of data being created, and locate connections within it, could have tremendous impact across many industries. Quantum computing offers the possibility of doing this significantly faster than classical computers. Further research will lead to the realization of this capability

- Cloud-based quantum computing: is the invocation of quantum emulators, simulators or processors through the cloud. Increasingly, cloud services are being looked on as the method for providing access to quantum processing.
- Quantum computers achieve their massive computing power by initiating quantum physics into processing power and when users are allowed access to these quantum-powered computers through the internet it is known as quantum computing within the cloud.


Autonomic Computing
By:- Lt Saket Pathak
Lt Rohan Saini


Increased Responsiveness
Adapt to dynamically changing environments
Business Resiliency
Discover, diagnose, and act to prevent disruptions
Self-Configuring
Self-Healing
Self-Optimizing
Self-Protecting
Operational Efficiency
Tune resources and balance workloads to maximize use of IT resources
Secure Information and Resources
Anticipate, detect, identify, and protect against attacks

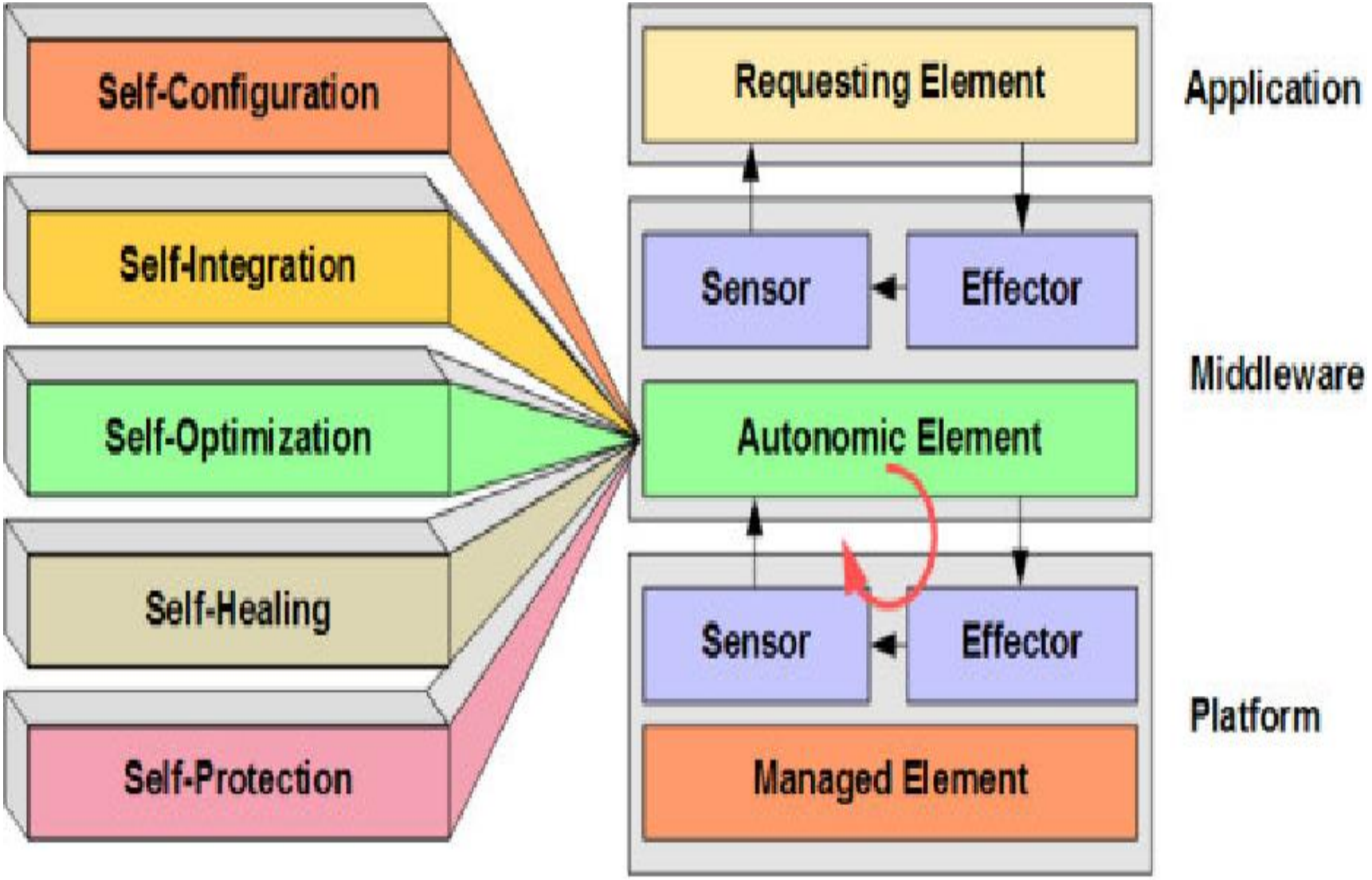


Fig 2: Autonomic Computing-Layered Approach

Autonomic computing is **a computer's ability to manage itself automatically through adaptive technologies** that further computing capabilities and cut down on the time required by computer professionals to resolve system difficulties and other maintenance such as software updates.

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- Computer vision is a field of artificial intelligence (AI) that **enables computers and systems to derive meaningful information from digital images, videos** and other visual inputs — and take actions or make recommendations based on that information.

- Machine learning is **used in computer vision in the interpreting device and interpretation stage**. Relatively, machine learning is the broader field, and this is evident in the algorithms that can be applied to other fields. The fields most closely related to computer vision are image processing and image analysis.

- **Computer vision** is an interdisciplinary scientific field that deals with how computers can gain high-level understanding from digital images or videos.

Cyber security

- Cyber security is the practice of defending computers, servers, mobile devices, electronic systems, networks, and data from malicious attacks. It's also known as information technology security or electronic information security. The term applies in a variety of contexts, from business to mobile computing, and can be divided into a few common categories.

- **Network security** is the practice of securing a computer network from intruders, whether targeted attackers or opportunistic malware.
- **Application security** focuses on keeping software and devices free of threats. A compromised application could provide access to the data its designed to protect. Successful security begins in the design stage, well before a program or device is deployed.
- **Information security** protects the integrity and privacy of data, both in storage and in transit.

- **Operational security** includes the processes and decisions for handling and protecting data assets. The permissions users have when accessing a network and the procedures that determine how and where data may be stored or shared all fall under this umbrella.

- **Disaster recovery and business continuity** define how an organization responds to a cyber-security incident or any other event that causes the loss of operations or data. Disaster recovery policies dictate how the organization restores its operations and information to return to the same operating capacity as before the event. Business continuity is the plan the organization falls back on while trying to operate without certain resources.

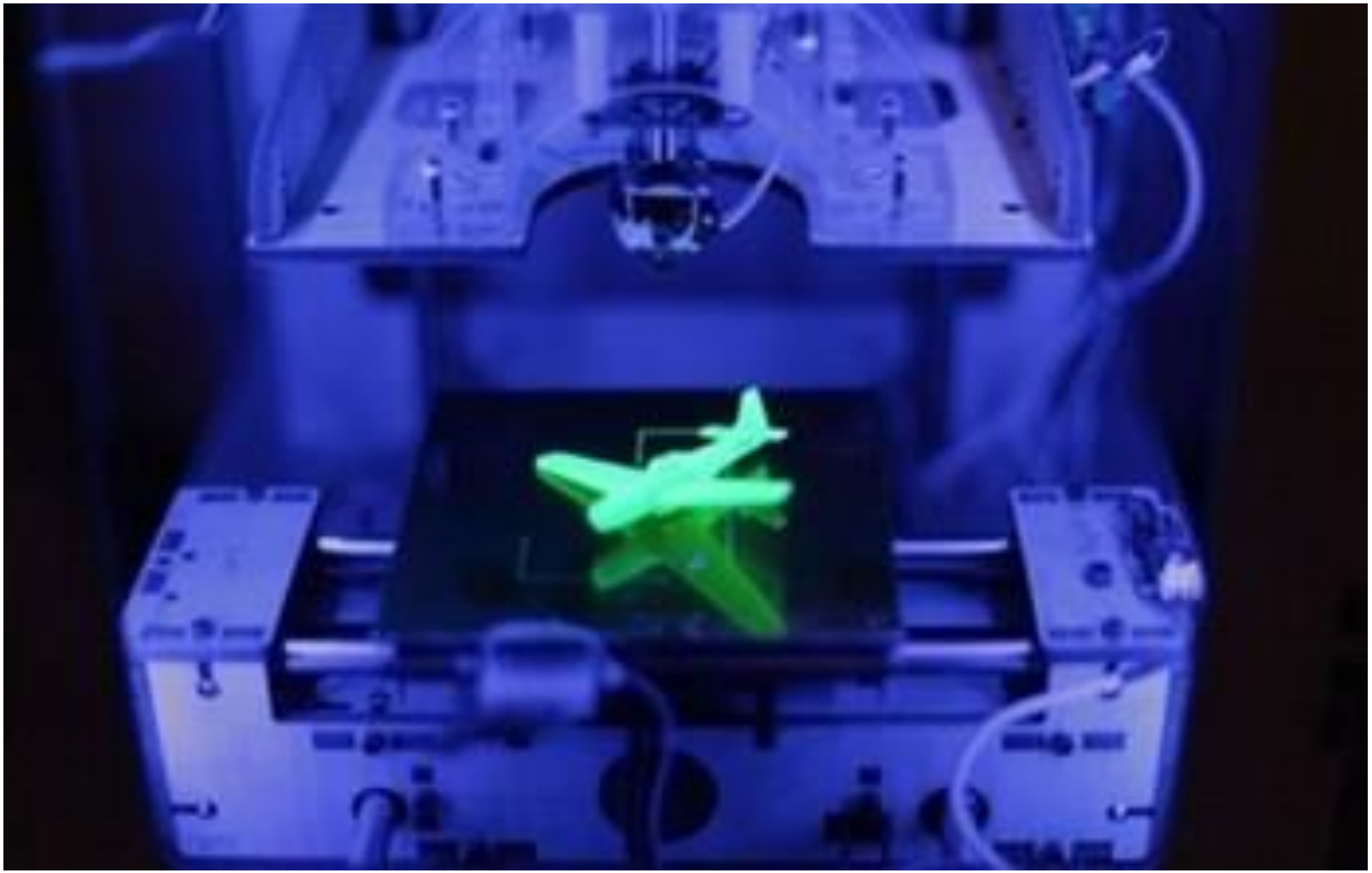
End-user education addresses the most unpredictable cyber-security factor: people. Anyone can accidentally introduce a virus to an otherwise secure system by failing to follow good security practices. Teaching users to delete suspicious email attachments, not plug in unidentified USB drives, and various other important lessons is vital for the security of any organization.

Types of cyber threats

- Cybercrime
- Cyber-attack
- Cyberterrorism
- Malware: Malicious Software
- Virus
- Trojans
- Spyware
- Ransomware
- Adware
- Botnets

Additive manufacturing (3D Printing)

- 3D printing or additive manufacturing is a process of making three dimensional solid objects from a digital file.
- The creation of a 3D printed object is achieved using additive processes. In an additive process an object is created by laying down successive layers of material until the object is created. Each of these layers can be seen as a thinly sliced cross-section of the object.
- 3D printing is the opposite of subtractive manufacturing which is cutting out / hollowing out a piece of metal or plastic with for instance a milling machine.
- 3D printing enables you to produce complex shapes using less material than traditional manufacturing methods.

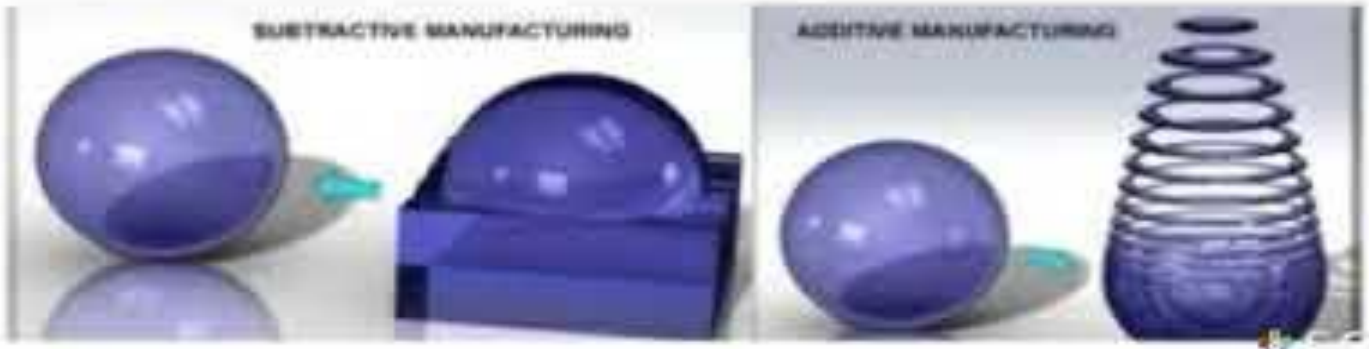


3D Printing

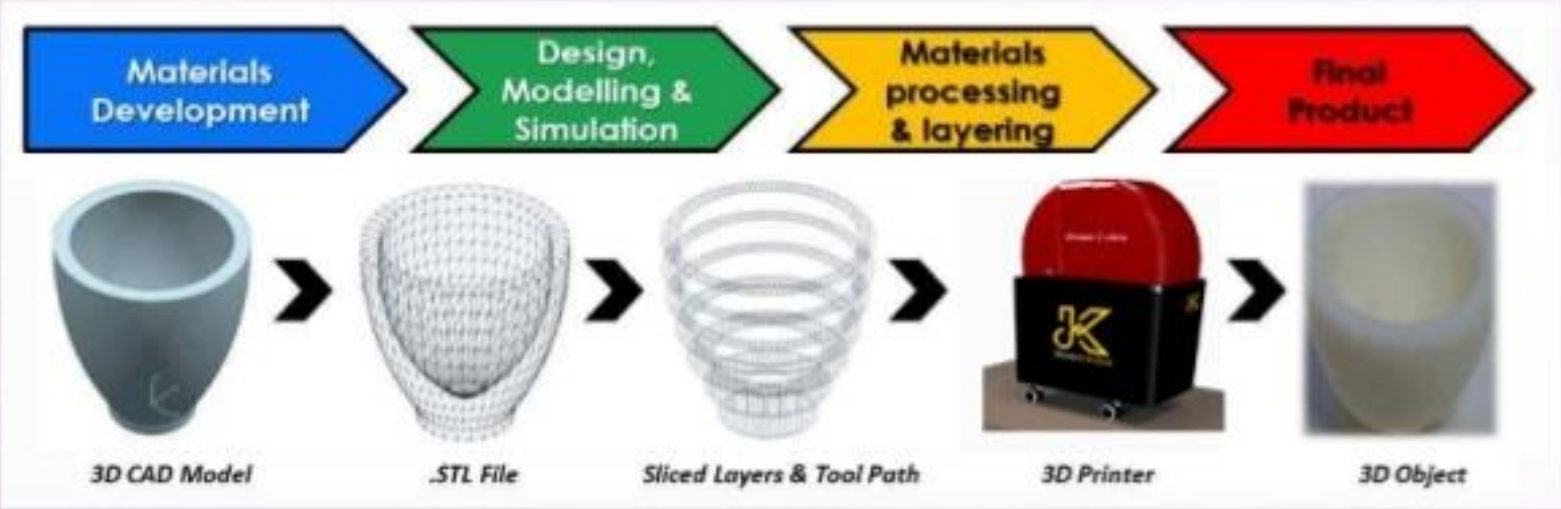
- Fascination, Fast moving technology
- Additive Manufacturing process
- Takes Complex Engineering Design geometries from the "can't be done" and "too expensive" to a world of anything is possible and very quickly.
- Enables both Rapid Prototyping and Manufacturing
- Can be used to Make Parts or Molds for Parts
- Multiple process and hybrids of these process in equipment ranging from $1K to S1M .

Additive Manufacturing

- The term 'additive manufacturing' was given by the ASTM F42 committee.
- **Additive Manufacturing** (AM) is the process of making 3D objects from computer model data by joining materials layer by layer under computer control using a 3D printer.



How does 3D printing work?



Advantages

- Flexible Design
- Rapid Prototyping
- Print on Demand
- Strong and Lightweight Parts
- Minimizing Waste
- Cost Effective
- Ease of Access
- Environment Friendly

Disadvantages

- Limited Materials
- Restricted Build Size
- Post Processing
- Large Volumes
- Reduction In Manufacturing Jobs
- Copyright Issues

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